REPORT DOCUMENTATION PAGE

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CONCEPTUAL DESIGN ANALYSIS
NORTHWEST BOUNDARY CONTAINMENT/
TREATMENT SYSTEM
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO
FY 82 MCA LINE ITEM 37
DACA 45-82-C-0064

VOLUME II

Prepared By
STEARNS-ROGER SERVICES INC.
4500 Cherry Creek Drive
P.O. Box 5888
Denver, Colorado
80217

Project No. C-26616

16 July 1982

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CONCEPT DESIGN ANALYSIS NORTHWEST BOUNDARY CONTAINMENT/TREATMENT SYSTEM

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VOLUME II

SECTION 1 - COST ESTIMATE BACKUP

SECTION 2 - DESIGN CALCULATIONS

CRAFT WAGE RATES (Denver Area)

TRADE	Rate Per Hr.	Health & Welfare	Pension	Vacation	App. Train.	Other	Average PT&I	Total Per Hr.
Carpenters	14.87	1.20	.85	1.00	.11		3.56	21.59
Electricians	17.85	.34	1.25		·06 ⁽²⁾	.58 ⁽¹⁾	3.96	24.04
Pipe Fitters/ Plumbers	16.82	1.00	1.50	1.00	.08		4.02	24.42
Laborer	10.23	1.04	.70	.75	.10	.05 ⁽³⁾	2.54	15.41
Operating Engrs Group 5	13.90	1.19	1.20	.60	.12	.05(4)	3.36	20.42
Millwrights	16.76	1.20	1.00		•29		3.80	23.05
Ironworkers	16.55	1.19	1.35		.17		3.80	23.06
Cement Masons	15.69	1.04	1.35		.13	.05(4)	3.60	21.86
Painter	15.61	.91	1.15		.08	1.42(5)	3.79	23.00

Notes:

PTI Average For Denver Area For The Above Crafts = 19.72018%

NEBF = 3% of Gross. Apprentice Training = 0.03% of Gross. Industry Promotion. Construction Advancement Program. Estimated Increase for 1982 - 8%.

CONSTRUCTION COST	DATE PREPARED SHEET /			1 OF 2					
PROJECT NW BOUNDARY COM	ر م ب ا		BASIS FOR ESTIMATE						
LOCATION	☐ CODE A (No design completed) CODE S (Preliminary design)								
ROCKY MT ARSENA	-] CODE ((Final d						
STEARNS - ROBER		THER (Sp							
DRAWING NO.		ESTIM		LeBel		CHECKE	KED BY HC		
BUILDING SUMMARY	QUANT	1		LABOR		MATERIA	\L	TOTAL	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	то	TAL	COST	
BUILDING									
SUB CONT		<u> </u>						64300	
PEE-ENGRD. METAL BLOG	·	-			ļ	-			
1-11 DIEVAIRIN 1001		-			-	-		1.1.2.0	
GIC OVERHEAD 10% GIC PROFIT 5%		-			1			6430 3537	
GIC PROFIT 5%		+			<u> </u>			3931	
TOTALD								14267	
	<u> </u>	 			<u> </u>	-		1	
ARCHIL		 				ļ		2748	
GIC PROFIT 10%		_						550	
GIC PROFIT 10%	-	+						330	
TOTAL A		 			<u> </u>			3628	
STRUCTURAL								63587	
GIC OVERHEAD 20%								12117	
GIC OVERHEAD 20% GIC PROFIT 10%					ļ	ļ		7630	
					 	-		83934	
TOTAL &		+						82724	
		+				 			
	+	1							

CONSTRUCTION COST		SHEET V OF					
PROJECT				<u> </u>	BASIS FO	R ESTIMATE	
							ssign completed)
LOCATION	CODE B (Preliminary dealgn)						
ARCHITECT ENGINEER		CODE C (Final HER (Specify)	design)				
						-	
DRAWING NO.		ESTIM	ATOR			CHECKED BY	
Philli Disto	QUANT	ITY		LABOR		MATERIAL	
BUILDING SUMMARY	NO. UNITS	UNIT MEAS.	PER Unit	TOTAL	PER UNIT	TOTAL	COST
MECHANICAL							97740
SUB/CONT-OVERHEAD 20%							19948
SUB CONT-PROFIT-1096					_		11729
SIC TOTAL							129016
'							1000
GIC. OVERHEAD-10%		ļ					12901
GIC PROFIT - 5%		-					1096
							10000
TOTAL D		-					149013
161 161 191 1 1 1 1 1 1 1 1 1 1 1 1 1 1							35447
EVECTRICAL AMERICAN 1/2/							5951
SUB/CONT OVERHEAD 16%							4140
SUB CONT PROFIT 10%							A5538
'S/C. TOTAL A:		 			-		17770
GICOHERHELD-10%							4554
GIL PROFIT -5%							2505
Mo thought 2/3		†					
TOTAL							52597
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* U.S. GOVERNMENT PRINTING OFFICE 1959 0-\$16148

CONSTRUCTION COST	DATE PREPARED 7-16-82 SHEET OF			1 of 2				
PROJECT NW BOYNDARY CONTA	BASIS FO							
ROCKY MT ARSETUA	CODE A (No design completed) CODE B (Preliminary design) CODE C (Final design)							
ARCHITECT ENGINEER STEARNS- ROGER					_	HER (Sp		
DRAWING NO.		ESTIM		LeBer		CHECKE †	HZ.	
Sugara I - I - I - I - I - I - I - I - I - I	QUANT	ITY		LABOR	M	MATERIAL		
SUPPORT UTILITIES SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER UNIT	то	TAL	TOTAL COST
SUPPORT UTILITIES								
BUILDING EXCAVATION				131	-	10	<u> </u>	282
SIC OVERHEAD 20%								102 56 35
SIC PROFIT 10%	\$100 Mark Color And 1 (14 Sept. 174							
5/C - TOTAL		ļ						313
GIO OVERHEAD 10%								37
610 PROFIT 5%								2
1.								
TOTAL D								431
KIKL GVAT OPPOANT				1218		196	20	3187
FUEL SYST. PROPANE SIC OVERHEAD 20%				100	 	1 10		637
50 PROFIT 10%								382
SIC-TOTAL								4206
611.01801810-1006								421
GIC OUERHEAD - 10% GIC PROFIT - 5%								231
TOTAL A						<u></u>		4858
		<u> </u>			-			
						•		
·								

CONSTRUCTION COST	DATE PREPARED SHEET 2 OF				2 of 2			
PROJECT				<u>1</u>	BASIS F	OR ESTIM		
LOCATION					_			gn completed)
					1 7		reliminary (C (Final de	
ARCHITECT ENGINEER					1	THER (Sp		··•·
DRAWING NO.		ESTIM	ATOR		1	CHECKE	ED BY	
_	QUANT	ITY_		LABOR	Τ	MATERIA	<u> </u>	
SUPPORT UTLITIES SUMMARY	NO.	UNIT MEAS.		TOTAL	PER		TAL	TOTAL COST
SUPPORT UTILITIES (CONT)								
		ļ	<u> </u>		<u> </u>			
SANITARY SYSTEM.				890		191	3	2803
SIC OVERHEAD 20%								561
SIC PROFIT 10%	L							336
SIC TOTAL						Ī		3700
· · · · · · · · · · · · · · · · · · ·	 	-	-		 			210
GIC QUERHEAD 10%		-			-			370
6/6 PROFIT 270		-	 		-	+	<u>,, , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	204
TATAL		+			 		THE 11	4274
TOTAL		-	 		-	+	· · · · · · · · · · · · · · · · · · ·	4014
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CONSTRUCTION COST E	STIMA	ΓE	DATE PREPARED 7/14/92 SHEET / OF /				
PROJECT NORTHWEST BOU	BASIS FO	R ESTIMATE					
TREATMENT 3	CODE A (No design completed)						
LOCATION	CODE B (Preliminary design)						
ROCKY MOUNTA		CODE C (Final dea	ign)				
ARCHITECT ENGINEER STEAKNS - RC	□ 07	HER (Specify)					
DRAWING NO.		ESTIM	ATOR			CHECKED BY	
		R	141	506		しまし	
	QUANT	ITY		LABOR	,	MATERIAL	
PROCESS SUMMARY	NO. ETINU	UNIT MEAS.	PER	TOTAL ≠	PER	TOTAL ∌	TOTAL COST
PROCESS EQUIPMENT							*
RAW WATER FEED PUMPS	4	EA	32	\$3,126	5,332	\$21,328	⁷ 24,454
RAW WATER PREFILTERS	6	EA	16	± 2,344	4,780	\$ 28.630	≠31,024
ADSORPTION SYSTEM EQUIP.	3	EA	136	¥9,964	_	₹38,000	\$647,964
BOOSTER PUMP	/	EA	32	\$ 78 1		≠ z,800	± 3,581
POST FILTER	1	EA	3z	<i>\$181</i>	-	\$70,133	\$70,914
AIR COMPRESSOR	/	EA	36	2579	_	#Z,300	\$3,679
TOTALS				17,875		763.741	781.616
GC OVERHEAD 10%							78.161
GC PROFIT 5%							42,988
			1				
TOTAL							902,765
							1
			<u> </u>				
		1					
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							<u> </u>
TOTAL				,-		2. /	

CONSTRUCTION COST	ESTIMAT	ΓE		DATE PREPARED SHEET			1 of 4		
PROJECT					BASIS FOR ESTIMATE				
N.W.BOUNDARY GROUP	4D WA	TEIZ	CONTI	sol system					
ROCKY MOUNTAIN AR	SENAL	م	MMER	ece chy, co	CODE 8 (Preliminary deeign)				
ARCHITECT ENGINEER				26616	OTHER (Specity)				
STEARNS ROGER DRAWING NO.		ESTIM			I	CHECK	ED BY		
		9	TEVE	, y.w.	T			,	
ARCHITECTURAL SUMMARY	QUANT	T	PER	LABOR	MATERIAL		AL	TOTAL	
TO THE SUMMARY	NO. UNITS	UNIT MEAS.	UNIT	TOTAL	UNIT	то	TAL	COST	
Preengineered Metal	1 -			Sub-con	trac	 		64,300.00	
Bldg 40x72-8:30 eave									
(see Manufacturer									
confirmation letter)									
SOME THE HOLE IS INC.									
Toilet Room									
· 6' Reinforced block	120	SF	21.86	\$ 546.50	\$1:00/SF	\$ 120	0,00	\$ 666.50	
	25	78	// // -						
wall 1415 x8:H-307 door									
· Door 287°	Ī	ea	21.59 HR	\$ 64.77	\$105/	\$10	<u> </u>	\$169.77	
	1	HR	21.59 HR	* 21.59	110/ set	\$	10,00	9 131.59	
· Door hardware		HR	/HK	ĺ	1	Į.	,	1 1 2 1 -	
	1	60	24 A 2	# = 0.07	\$125,	3, -	25.00	\$ 198.26	
·Lavatory	3	HR	748	[‡] 73.26	ea		45.	10.29	
		es	21.69 /	*	\$ 24/ec	* -		34.80	
· Soap Dispenser	اخ.	HE	21.59/42	\$10.80	- /ec	72	4.00	77.80	
		84	21.50	i	Salar	\$.	· ·	#	
· Mirror	.5	HR	21.59	\$ 10,80	546/eq	\$40	0.00	*54.80	
		00:	21.55		4100	-			
· Toilet Paper Dispenser	.5	HB Ga	21.59/45	F10.80	\$14/ec	1 14	,00	24.80	
		-			414	-		<u> </u>	
· Paper Towel Dispenser	,5 ,5	HR	21.59	\$ 10.80	\$ 25/ca	72	5.00	35.80	
Trash Container	.5	HR	15.41 HR	\$7.70	\$15/09	\$15	,00	*22.70	
		t	l	l .					
Drinking Fountain	2	ea	24.42 HR	[‡] 48.84	265/69	\$20	15.00	313.84	
			1						
EMERS. EYEWASH & SHOWER	1/2	eq HR	24.42 HR	*48.84	335/29	\$2	35.00	383.84	
				854.70		3118	4,00	2038.70	
sub-total		+-		031.10	†	1110	71		
+ Subcontract		+			 	-		166,338.70	
TOTAL	<u></u>	<u> </u>	<u> </u>	<u> </u>	1	• 4 5 6		1001230.10	

CONSTRUCTION COST	CONSTRUCTION COST ESTIMATE						SHEET	2 of 4	
PROJECT		_			BASIS FO	R ESTIM	ATE		
N.W. BOUNDARY GROUND W	JATEIZ	CONT	1200	system	1 . —			completed)	
ROCKY MOUNTAIN ARSEN	مد ر	comm	nerc	e city, co	1 —		reliminary d : (Final des		
ARCHITECT ENGINEER STEARNS - ROBER					OTHER (Specify)				
DRAWING NO.		ESTIM	ATOR	\	CHECKED BY				
	,		TEVE						
AROHITETURAL SUMMARY	QUANT	UNIT	PER	LABOR	PER	ATERIA		TOTAL	
30mm	UNITS	MEAS.	UNIT	TOTAL	UNIT	то	TAL	COST	
Painting									
· Block wall	240	SF HR	23.00 UR	# 138.00	14/5F	* 33	1.60	±171.60	
· poors 4 doors x 2 sides	8	HR	23.00) HR	\$ 92.00	2.10	\$ 17	.28	109.28	
700. 7 4 6000 7 4 616462									
·PLywood 505F+2	1.00	SE HR	23.00 HR	\$ 92.00	16/SF	\$ 16	00	108.00	
* P LY W 8 8 4 3 5 1 5 6	4	HE	/#	,		14			
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	50	SF	21.59	₹43.18	71/SF	\$25	50	78.68	
Metal studs Galao.c.	2	HR	-HR	77.16			<u> </u>	10.00	
01	. (69 H12	23.00	\$ 23.06	5.0°/ea	F. 5	00	28.06	
Clip anale 13,3,1/4					rea	7	,	25,06	
2.1	2	Shts	21.59 HR	#40.0	25/	. .		64.10	
PLywood decking 34.0	3	HR	HR	*43.18	25/snt	£50	0,00	93.18	
		4 1774	01.59	•	23,	4		-	
Plywood ceiling 1/2"A.C.	2	H6	21.59 HR	P43.18	23/5HT	\$ 46	,00	89.18	
•									
6" Both Fiberglass Ins.	50	SE HR	21.59 HR	21.59	. 20 /SF	\$10	,00	31.59_	
TOTAL				\$ 496.19		\$21	3.38	\$ 709.57	
IOIAC		†			†				
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CONSTRUCTION COST	TAMITZ	F		DATE PREPARED SHEET 3 OF 4				
PROJECT			1	BASIS FOR ESTIMATE				
N.W. BOUNDARY GROUND	WATE	S C	とという	ol system	_	CODE A (No desi	gn completed)	
ROCKY MOUNTAIN ARSEN	Δ1	304 M	いこけっこ	CITY CO		OE & (Preliminary		
ARCHITECT ENGINEER	<u> </u>	210(10			CODE C (Final design)			
Stearns-Robeiz								
DRAWING NO.		ESTIM	ATOR TEUE	v.w.	CHECKED BY			
2.42.1	QUANT	TY		LABOR	,	ATERIAL		
ARCHITETURAL SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST	
Sewage Disposal								
· Septic Tank-500gal	4	eq HR	20,42 HR	81.48	220/29	\$ 220.00	¥301.68	
excavation	2	HR	20.42, HR	40.84			40.84	
backfill	2	HR	20.42 HR	40.84		-	40.84	
			20.43		7.05		<u> </u>	
· Dosing Tank	4	HR	20.42 /HR	81.68	200/eq	*200.00	*281.68	
excavation	2	HR	20.47 HR	40 84			40.84	
backfill	2	HR	20.42 HR	40.84			40.84	
·Trench								
4" clay pipe -	25 4	LF	24.42 HR	97.48	1.60/LF	\$40.00	\$ 137,68	
excavation	2	HR	20.42/	40.84			40.84	
backfill	2	HR	20.42/ HR	40.84	_		40.84	
EGENTIII		1,	PK.	1 1 1				
· Distribution box	-4	ea	20.42 /HR	81.68	150/01	\$150,00	[‡] 231.68	
excavation	2				_	-	40.84	
backfull	2	HR	10.42 HR	40.84	_		40.84	
· Leaching Field			74 /3		1.00			
perforated PVCpipe	140	LF HR	24.47 /HR 2042	91.68	1.00 /LF	*140.00	\$ 237.68	
execuation 36×20×1	2	1112	1	// // // //			40.84	
backfill Maravel	720	SF HR	THR	40,84	124/SF	\$172.80	213.64	
backfill covering	2	HR	20.42 HR	40.84			40.84	
·Backhoe rental	2	Day			495 DAY	\$990.00	990,00	
3/4 CT				·				
				\$889.6A		\$1912.80	\$280244	

CONSTRUCTION COST E	STIMA	ΓΕ		DATE PREPARED		SHEET 4	4 of 4
PROJECT NINN BOUNDARY GRO LOCATION ROCKY MOUNTAIN ARSEN				CONTROL	2 00	RESTIMATE CODE A (No design DE 5 (Preliminary d CODE C (Final des	eeign)
ARCHITECT ENGINEER STEARNS-ROGER						HER (Specify)	
DRAWING NO.		ESTIM.		E V.W.		CHECKED BY	
ARCHTECTURAL SUMMARY	QUANT	UNIT	PER	LABOR	PER	TOTAL	TOTAL COST
Summary Sht	UNITS	MEAS.	UNIT		UNIT		
Sheet				3 854.70		F1184.00	2038.70
+ Subcontract \$64,300							64,300.00
SHEET Z				T496.19		213,38	* 709.57
SHEET 3			×	*889.44		1912.80	2,802.44
TOTAL				2,240.53		3,310.18	69,850.71
PREENGINEERED BLOG.							64,300.00
TOILET ROOM				\$931.21		₹730.50	1,661.71
SEWAGE SYSTEM				889.64		F1912.80	2,802.44
Drinking Fountain				48.84		\$ 265.00	313,84
EMERG. EYE WASHESHOWER				48.84		*335,00	383,84
PAINTING				322.00		3 66.88	3.88.88
				\$.2,240.53		43310.18	
		+-					
TOTAL							69,850.71

CONSTRUCTION COST	FSTIMAT	Œ		DATE PREPARED	97		SHEET	1 or 5
PROJECT			<u>_</u>			R ESTIM		
GROUND WATER TO						-		n completed)
ROCKY MOUNTAI	~ A	æ Se	NA	۷_	CODE & (Preliminary design)			
ARCHITECT ENGINEER	بر کھ	. ,		266160	CODE C (Final design) OTHER (Specify)			
ARCHITECT ENGINEER STEARNS ROGER DRAWING NO.	200	ESTIM	ATOR	WG C-		CHECKE	DBY	
	!	G	<u>- J. V</u>	VHITTALL				
STRUCTURAL SUMMARY	QUANTI	TY	PER	LABOR	PER	MATERIA	·L	TOTAL
300000	UNITS	MEAS.	UNIT	TOTAL	UNIT		TAL	COST
EXCAVATION:						EQUIF	PKENT.	
TRENCHES & GRADE BM'S	78.5	CY.			102	\$ 8	30°7	80.07
	3,5	MH	1541	\$53.94				53.94
BLOG FOUNDS & EDUIPMENT		CY			102	\$ 9	≥2 <i>⊙</i> 8	55.08
		MH	1541	24623				46.23
FLOOR & DOORWAYS	37.0	CY		,	043	\$,	15.91	15.91
	20	· • .	1541	\$ 3082				30.82
	549		_	130 99		15	ماه	282.05
BACKFILL:	- P16-2							
To FOUNDATIONS ETC	72	CY			137	8 4	1864	98.34
		MH	15型	\$ 3082				30.82
STRUCTURAL BACKFILL	58	CY			650	- ≰3	377≈	377.00
	17.5	MH	154	\$26968				234.68
VAPOR BARRIER								
4MILS DVC	3708	s‡			180	\$66	7440	6,674.40
	8	MH	1541	\$12328				123.28
/.								
CONCRETE: TO 3000								
Compresse With Forms				,				
& RE-BAR						Ĺ.,		
FLOOR SLAS	26.0	CY			58≌	\$15	08°	1,508.00
	34.0	MH	2186	\$74324				743.24
EQUIPMENT TOUNGS	44	CY			650	\$2	860 2	3,850.00
	129	MH	2186	3281994				2,819,94
		1						-
DOOR PADS	7.5	CY			582	\$ 2	135.00	485.30
	10.0	MI	2186	\$ 21860	-0	 7		218.60
ENC BORN	10.0	1,1		T			VERNMENT PRINT	

CONSTRUCTION COST	FSTIMAT	F		DATE PREPARED 7-/2-82			SHEET 2	2 of	5
200155				1	BASIS FO			-	
GROUND WATER	TREA	TMI	BUT	TACILITY		CODE	(No design	completed	υ
LOCATION ROCKY MOUN-					_		reliminary de		
ARCHITECT ENGINEER	[2]	/~~			_		(Final desi	a n)	
STEARNS ROGER						HER (Sp			
DRAWING NO.		ESTIM		WHITTA	CHECKED BY				
	QUANTI		* 1 _0	LABOR	7	ATERIA	i.L		
STRUCTURAL SUMMARY	NO.	UNIT	PER	TOTAL	PER	то	TAL		TAL DST
/6 3	UNITS	MEAS.	UNIT		UNIT				
CONCRETE (CONT)						Д.			
BUILDING FOUND'S	8.1	2			712	\$1.5	575.10		75.10
	32	MH	2186	\$69952				<u> </u>	9.52
GRADE BMS & TRENCHES	53	CY			1020	\$5.	406 =	<u> </u>	06.00
CANCEL OF THE PARTY OF	440		2186	\$ 961840		• /		9.6	18.40
	170	1.1.1		4 1010-					
1#	100	SF			350	\$	43,75		43.75
GROUT 1" THICK	12:5		-126	4,-8		- 4	40,10		65.58
	3.0		2136	\$ 6528		#	, , , , ,		
GROUT 2" THICK	708	sŧ	~	11 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	72	3 2	19565		756.00
	227	MH	2150	\$ 496222	1			4,0	14.22
EXPANSION AND									
ISOLATION JOINTS	498	L#			054	#	268.92	2	68.92
13000 1000 13		МН	2159	\$ 23749				2	37.49
H = ±	498			7 2 2 /	017	\$	84.66		84.66
JOINT FILL	778	l '.	2159	\$1943		T		1	94.31
	1 7	MH	-1	414-	 				/
S	 		<u> </u>		-	 			, , , , , , , , , , , , , , , , , , ,
STEELWORK.	 	<u> </u>	<u> </u>		205	di	7200		.20 00
CURB L FOR RESIGHES		7 7		H = 14	302	1	732€		32.20 33.44
	24	MH	2306	\$ 55344	<u> </u>	<u> </u>			53,44
		ļ							
GRATING									
FOR TRENCHES 14 THICK	276.5	SF			682	\$	1894.03	1, 8	94.03
The property of the second	11.0	MIF	23%	\$ 2536				2	53.66
FOR WALKWAYS 1" THICK	312.5	1 .			450	\$	406.25	1,4	106.25
TOK WALKWATS I MIEE	22		2306	\$ 50733		1 11		و	07.32
	1 2'2	1,14	45	y 20/2	+	 			
	+	4			25=	*	21502		150.00
ACCESS LADDERS	1 0/4	14	i	}	1 23-	1 4 Z		or j	フロ・ロリー
NO CAGE	33		2306	\$ 76098	+				160.98

CONSTRUCTION COST		7-/2	-82	SHEET	3 or 5			
GROUND WATER	TOE	4 T N	1527	1	BASIS FO	R ESTIMATE		
LOCATION						CODE A (No design DE 8 (Preliminary de		
ROCKY MOUNTAIN	J AA	<u> </u>	UAL			CODE C (Final desi		
STEARNS ROGER	2				OTHER (Specify)			
DRAWING NO.		EST IM		WHITTAL	CHECKED BY			
C-0. 7.001	QUANT	TY		LABOR	À	ATERIAL	TOTAL	
STRUCTURAL SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST	
STEELWORK (CONT)								
HANDRAIL & KICK PE	230	LF			223	\$5060=	5,030.00	
•	37	MH	2305	\$ 853 32			853.22	
				,				
ANCHOR BOLTS								
ANCHOR BOLTS I" \$\phi \times 18" Lowg	40	EA			360	\$ 1445	144.00	
	22		2159	\$47498			474.98	
1" \$ x 24" Loug	16	EA		,	425	\$ 68-5	68.00	
	10	MH	2159	\$21590			215.90	
3/4" Øx 18" Long	24	EA		,	233	\$56.40	56.40	
	10	MH	2159	\$ 21590			215.90	
EXPANSION BOLTS								
3/ 0 × 7"Long	16	EA			380	\$60.80	60.80	
Deilling	16	EA			047	\$ 7.52	7.52	
	5	MH	2159	\$ 10795		,	157.95	
STEEL FRAMING TO								
WALKWAYS	4402	24		\$ 161925	000	\$2641.20	2,541.20	
	75	MH	2159	\$ 161925			1,519.25	
				3,487.20		8,037.92	11,525,12	

CONSTRUCTION COST	CONSTRUCTION COST ESTIMATE							4 0 5
PROJECT GROUND WATER TRES	27.1	المرجع	r #	7-13-	BASIS FO			
LOCATION 1	1	<u>~~</u> /					, (No desi e r reliminary d	completed)
LOCATION ROCKY MOUNTAIN ARCHITECT ENGINEER	<u>مر</u> ر	res E	NAL				(Final des	
STEARNS ROGE	~				o1	HER (Sp	ci (y)	
DRAWING NO.		ESTIM	ATOR	WHITTH	3 2	CHECKE	OBY	
	QUANTI	L		LABOR		MATERIA	L	
STRUCTURAL, SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	70	TAL	COST
SLAB FOR PR	PA	VE	Ú	TORAGE	TA	NK	.′	
,						5001	4 <u>08</u>	
EXCAVATION:	4	ج.>			/ 93	-28	408	4.08
	ONE	MH	1541	\$1541				15.41
	/ 22				650	7	865	8.65
STRUCTURAL BACKFILL	/. 33	T	1541	\$15-1	0-	- 47	0 =	15.41
	ONE	MIT	12 -	7752	<u> </u>			72, 17
NAA a Bassie								
VAPOR BARRIER 4 MILS PVC	72	s/=			180	\$	12960	129.60
27 MILS 1.V.C	ONE		154	\$ 1541	/	-	/	15.41
	0,40	177.1	/ 5 -	# / -				
CONCRETE fc 3000	2.67	CU			65°	\$	17355	173.55
COMPLETE WITH	7.85	MH	218%	\$17166				171.60
FORMS & COEAR		<u> </u>						
/				-4000		-4-	· - 09	1=3277.
TOTALS				\$ 2178	<u> </u>	\$3	5/5 50	\$53377
		ļ			<u> </u>			
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		+	†					
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CONSTRUCTION COST	CONSTRUCTION COST ESTIMATE					DATE PREPARED 7-/2-82 SHEET 5 OF . BASIS FOR ESTIMATE			
GROUND WATER	TREA	TME	シング	FACILITY	BASIS FOR	CODE A (No design			
ROCKY MOUNTAIN ARCHITECT ENGINEER) A	0 S	اعدل	/ / / /		E & (Preliminary	deeign)		
ARCHITECT ENGINEER STEARNS ROOM	<u> </u>	200/	-, 65		CODE C (Final dealgn) OTHER (Specily)				
DRAWING NO.	74.	ESTIM	ATOR	WHITTA	<i>K</i>	HECKED BY			
	QUANT		· · · ·	LABOR		ATERIAL			
STRUCTURAL SUMMARY	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	TOTAL COST		
TOTHLS									
							_		
SHEET I		-		\$4336.55		12,104.10	\$16,440.65		
		 		4, 92			13=31013		
SHEET Z				\$1785292		1 /, 5/6.71	135,369.63		
SHEET 3				\$348720		8,037.92	811525.12		
<u> </u>									
SHEET 4				217.89		315.88	533.77		
				25,894.56		37,974.61	63,869.17		
		ļ			 				
EXCAVATION FROM PG 1				130 99		15106	282 05		
NET STRUCTURAL				25, 763 57		37 823 55	63, 587 12		
IVET STRUCTURE									
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		-							
		-							
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		+	<u> </u>						
		1							
·									
							<u> </u>		

CONSTRUCTION COST	ESTIMAT	E		DATE PREPARED SHEET			\ of 3	
PROJECT	·					R ESTIMATE		
NW BUNDARY TREATIN	EIUT	HAC	LITY			CODE A (No design		
ARCHITECT ENGINEER		ENVE	EK Co	occ.		DDE 8 (Preliminary CODE C (Final de		
ARCHITECT ENGINEER	,			26616	OTHER (Specify)			
DRAWING NO.		EST IM			CHECKED BY			
	QUANTI		TRO	LABOR M. H.	· · · · · ·	JMC MATERIAL		
HVAC SUMMARY	NO.	UNIT MEAS.	PER		∯PER UNIT	# TOTAL	TOTAL COST	
PROPANE UNIT HEATERS	4	EA	4	16	480	1920 -		
(HODINE PA - 50)								
THERMOSTATE 40°F RATED	4	EΑ			<i>5</i> 5	225.7		
(BERGER-COMEN TA-115)			<u> </u>					
(MOUNTED BY ELEETR)					<u> </u>			
PIPE C.S. SCH 80								
3/4" DIA	200	LF	.14	28	1.62	324,-		
					<u> </u>			
ELBOW, 19.1. 150 900								
3/4 * D/A	20	خرع ا	.57	11.4	.72	14.70		
		<u> </u>			 `	`		
TEE, H.I. 150"				2.0	 			
3/4"	10	EA	.89	8.9	1.14	11.40		
					 			
720G M. K. 1304		<u> </u>			<u> </u>			
1/12"	5	EA	.50	2.5	1,00			
UNION WILL BOOF	5	F 14	.62	3.1	4,38	21,90	· ·	
VALUE, PLUG		<u> </u>						
150 * YEREWED	10	E4	.40	4.0	10	100.00		
		<u> </u>						
i .		<u> </u>		_	 			
HANGERS & SUPPORTS	120	16		3.0	.65	78.00		
				ļ		70		
SUBTOTAL PAGE 1	1	1		76.91	<u> </u>	2694.70	<u> </u>	

CONSTRUCTION COST	CONSTRUCTION COST ESTIMATE						SHEET (2 of 3	
PROJECT	بس				TE				
NW BOWNDARY TREATMENT	HACI	١٢٢			CODE A (No design completed)				
ROCKY WITH ARSENHE	DEN	ER	<u> </u>	o	CODE a (Preliminary design) CODE C (Final design)				
3		,			OTHER (Specify)				_
STEIRN'S - NOGER DRAWING NO.		ESTIM			CHECKED BY				
		<u>l</u> .,	T	KO				_	
HVAC SUMMARY	QUANT	UNIT	PER	LABOR M. H.	SPER	TOTAL		TOTAL	
	UNITS	MEAS.	UNIT	TOTAL	UNIT	\$P TOT 2			
SUPPOTAL PAGE I				76.9		2690	4,79		
VENT CHIMNEY . 5"DA.	100	L.F.	25	25	2,50	25	5 00		
VENT CAP	4	EA	25	1	10	40.	<u> </u>		
PROPADE TACK 1000 GAL	;	EA	16	lic	1500	١٤٥	0		
COMPLETE WITH ALL									
VALUES & FITTINGS									
(FATON LPG TANK)									
REWLATER VALVE 314 314	1	ΞA	١	\	40	40	ه. ح		
(THON TO HOTHIC)	1		\\			ļ			
(-7,101) W MOTHIC		1			<u> </u>				
		 							
- \		-			a.T	.5.			
FIMMET FAN KEEDER	<u> </u>	EH				· · · · ·	•=		
A Fill		-			 				
		+			 	 			
		_ _			 	0 -			
Dyrmyr SOFT 5"DIA	25	FT		10	صد.	2.7	\circ		
CALL STELL	<u> </u>	+							
		+			-				
		-		<u> </u>	 				
MRG. C-KHILE COXLE"		EH		1	-	5	. –		
			<u> </u>		 				
					<u> </u>	<u> </u>			
THERING JAT CAREL-COMAN	1	EA			4C	40			
TH-121)									
					ļ		20.		
SURTOTAL PACE Z				123.5	1	4645	70		

CONSTRUCTION COST	ESTIMAT	E		DATE PREPARED 7-13-82		SHEET	3 of 3		
PROJECT NW BOUNDARY TREATMENT F	ACTI 1TY	,			BASIS FOR E	STIMATE De a (No design	n completed)		
							s (Preliminary design)		
ROCKY INTO ARSEVAL TARCHITECT ENGINEER	DENVE	K CC	٠٥٠.		CO	DE C (Final des S (Specify)	r(gn)		
STEARNS - ROWER		ESTIM				ECKED BY			
DRAWING NO.		ESTIM	TKO		Chi	JMC			
111/1/10	QUANT	ΙΤΥ		LABOR		ERIAL	TOTAL		
HVAC SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	J.N.	TOTAL	COST		
TOTAL FROM PGZ				123 SMH	#2	1645. 20			
						· · · · · · · · · · · · · · · · · · ·			
COST OF LAROR	123.5	nl.H	24A2	3015.87					
TOTAL COST				3015. 57	4.	645 😤	766177		
BREAK OUT									
FUEL - PIPING				32.9		428,70			
- PROPAIUE TK				17.0		1540.00			
COST OF LABOR	49.9	MH	32442	121854					
TOTAL COST. FUEL (SU							3187.26		
				P					
		1							
		†							
		1							
		T							
		1							
	<u> </u>	1-	 						
	ļ	+-	 		 				
		 							
		+	 		1				

CONSTRUCTION COST	CONSTRUCTION COST ESTIMATE						/ of 5
T			,	,	8.82 BASIS FO	R ESTIMATE	
PROJECT NORTH WEST BOW LOCKY MOUNTAIN ARCHITECT ENGINEER	WOARY	/	ONTA	INMENT/		CODE A (No design	
LOCATION PARKET AMAZINE	, 10-	REA	TMEN	11 2457611	eaign)		
ARCHITECT ENGINEER	AK.S		76	·] CODE C (Final dee rmer (Specify)	(5)
DRAWING NO.		ESTIM		PULEY		CHECKED BY	
	QUANT	TY	1,405	LABOR		MATERIAL	
PLUMBING SUMMARY	NO. UNITS	UNIT	PER	TOTAL W.H.	PER	# TOTAL	COST
PIDE - 457M B-88							
TYPEK							
3/1"	107.0	1/2	. 19	20.33	1.62	173.34	
3/4" 1/2"			.16	2.40	1.17		
17	13-1	-72	. 10	2.40	1.1.1	11.55	
FITTINGS							
WROJGHT COPPER		ļ					
SOLDER YOUNT	ļ	<u> </u>			 		
ANSI B16.22					ļ		
7FE							
3/0"	1	EA	-67	.67	.52	,52	
				-			
950 511	<u> </u>		1				
90° E11 3/4" 1/2"	8	ĒA	. 42	3.36	.38	3.04	
1/2"	4	EA			.14		
	 	-4	1.40	7.60	1		
A DU DI WIE		†	 		1		
COUPLING		†	<u> </u>	<u> </u>			
3/4"	1	مىي	,38	1.52	.20	.80	
-74	4	E4	1,50	1.06	1.20	.,,,,,	
2	+	+	 				
BUSHING	 	+-	+			 	
	 	-			+		
2/11/11		+		1 11	+	10	<u> </u>
3/4" x 1/2"	3	EA	1.38	1.14	120	.60	
	-	-	 		-		
		-	-			101 11	
SUBTOTAL PAGE 1			<u> </u>	31.02		196.41.	<u></u>

CONSTRUCTION COST	ΓE		DATE PREPARED 13 - 2 V SHEET 2 OF 5							
PROJECT							R ESTIMATE			
LOCATION							CODE A (No design			
						CODE S (Preliminary design)				
ARCHITECT ENGINEER						. —	HER (Specify)			
DRAWING NO.		ESTIM	ATOR			' 	CHECKED BY			
		<u> </u>		HORN	LEY					
PLUMBING SUMMARY		NO. UNIT		LABOR			IATERIAL	TOTAL		
SUBTOTAL PAGE 1	NO. UNITS	MEAS.	PER	то	TAL MH	/ UNIT	TOTAL	COST		
ปมเอพร -				1	1.02		196.41			
WROYGHT COPPER										
SOLDER JOINT					-					
Comer Com										
1/2"	2	FA	.42		34	1.47	2.94			
- 72	-	1	.,,=	<u> </u>						
3/4"	2	EA	,44	 	88	127	3,64			
74		EA	1,47	· ·	00	1.02	<u> </u>			
		<u> </u>								
	<u> </u>	+		-		 				
		 				-				
VALVES - GLOBE	<u></u>	-				-				
125 # BRONZE		<u> </u>		-						
SOLDER VOINT		ļ		<u> </u>		<u> </u>				
·				<u> </u>						
1/2"	3	EA	.33		99	11.50	34.50			
3/4"	2	EA	.40		80	14.75	29,50			
		1								
	 	1	1							
	 	+	 	<u> </u>			-			
	-	+ -	1	+		+				
	 	+-	1	+		+				
	-	+-	-	-		+				
	 	+-	 	+		 				
		-								
			 	 						
		-		-				 		
SUBTOTAL PAGE ?			1	3	4.53		266.99			

CONSTRUCTION COST E	STIMA	ΤE		DATE PREPARED 7./3	·82	SHEET3	0F 5	
PROJECT /				, ,	BASIS FOR ESTIMATE			
NORTH WEST BOLLOCATION AND AND AND AND AND AND AND AND AND AN	INDAK	<u>ey (:</u>	ONTA	INMENT/		CODE A (No design	1	
LOCATION POPULATION	10	REAL	TME	UT SYSTEM	CODE B (Preliminary design)			
ARCHITECT ENGINEER	48561	44			CODE C (Final design) OTHER (Specify)			
					CHECKED BY			
DRAWING NO.		ESTIM		VORILEY				
	QUANT	ITY		LABOR	М	ATERIAL		
PLUMBING SUMMARY	NO.	UNIT	PER	TOTAL	PER	TOTAL	TOTAL COST	
SUBTOTAL PAGE 2 -			-	-34.53		266,99		
ASTM A-74 HUB.								
/0		1						
W/PLAIN END SPIGOT SERVICE WEIGHT								
SEKVICE WEIGHT		1						
4' x 6'-6"	3	EA	2.36	7.08	4.68	91.26		
4' × 6-0"	2	EA	2.18	4.36	4.68	56.16		
9'x 5'0"	3	EA	1.82	5.46	4.62	70.20		
					<u>'</u>			
4 x 10-0"	2	EA	3.64	7.28	4.68	93.60		
FITTINGS								
CAST IRON ASTM					ļ			
A-74 SERVICE WEIGHT								
NIPPLES								
4'x 1-0"	1	EA	136	1.44	4.68	18.72		
4×1-6"	4	EA	.55	2,2	4.68	28.08		
7110	<u> </u>							
4 2 2 0"	4	EA	,73	2.92	4.68	37.44		
4720	1 7				1			
4", 21/8"(A5 1')	4	EA	.36	1-44	4.68	4.68		
7 1 2 10 10 1	 							
			1					
SUB TOTAL PAGE:3				66.71		667.13		

CONSTRUCTION COST E	CONSTRUCTION COST ESTIMATE								
PROJECT					-13-82 SHEET 4 OF 5 BASIS FOR ESTIMATE				
						CODE A (No design			
LOCATION					CODE & (Preliminary design)				
ARCHITECT ENGINEER						CODE C (Final deal HER (Specify)	en/		
DRAWING NO.		ESTIM		لاء رار ۵ ۱۱		CHECKED BY			
	QUANT	177		HORNLEY LABOR	<u>_</u>	MATERIAL			
PLUMBING SUMMARY	NO.	UNIT	PER		PER	TOTAL	TOTAL COST		
SUBTOTAL PAGG 3 -	UNITS	MEAS.	UNIT	TOTAL N.H	UNIT				
Y. BRANCH			-	66.71		667.13			
90° LONG TURN				,					
TONG TURN									
4//	2	F1	0.00	1 12	1000	31.60			
4"	2	F4	2.00	4.00	13.00	2/,60			
	<u> </u>	 							
		1							
		+	 		 				
	ļ	+			 				
					 				
	<u> </u>	1							
			+						
P-TRAP	ļ	<u> </u>			 				
					ļ				
1"	3	EA	1.23	3.69	12.45	37,35			
-					-	·			
		+							
100 1	 				 				
45° ELBOW	-	+-	-	<u> </u>	+				
	 								
9"	12	EA	1.23	14.76	6.75	81.00			
	1	1							
	+	+-			+				
90° ELBOW	-				+				
						-			
4"		E4	1,23	1.23	8.50	8.50			
	1	\top	1						
			+						
			+	0		8 25.58			
SUBTOTAL PARE &	l	1	1	90.39	1	1 0 23.28	I		

CONSTRUCTION COST	ΓΕ		DATE PREPARED	7-13-82 SHEET 5 OF 5					
PROJECT						R ESTIMATE			
LOCATION					☐ CODE A (No design completed) ☐ CODE B (Preliminary design)				
ARCHITECT ENGINEER					CODE C (Final design)				
					01	HER (Specify)			
DRAWING NO.		ESTIM	ATOR	THORNLEY	CHECKED BY				
	QUANT	ITY		LABOR	I	AATERIAL			
PLUMBING SUMMARY SUBTOTAL PAGE Q-	NO. UNITS	UNIT	PER	TOTAL M.H	PER	TOTAL	COST		
PIPE CS.				90.39		825.58			
GALVANIZED									
ASTM A-120	-								
4"	30	بحري	.44	13,2	11.95	358.50			
FLOOR DRAIN									
JOSAM SERIES									
3510 4"	10	EA	1.33	/3.3	41.40	414.00			
		<u> </u>			<u> </u>				
		 				, , , , , , , , , , , , , , , , , , ,			
FLOOR CLEANOUTS	1	EA	1.33	1.33	14.40	14.40			
JOSAN SERIES 8/84		├							
		-							
				118.22		1/ 12 40			
SUBTOTAL PAGES		-		110,00		1612.48			
					<u> </u>				
			<u> </u>						
TOTAL COST OF									
		NH	20.47	2886,93					
		77.	7,7,7						
TOTAL COST OF									
MATERIAL						16/2.48			
TOTAL COST							4,499.41		
							· · · · · · · · · · · · · · · · · · ·		

CONSTRUCTION COST	ΓΕ		DATE PREPARED 7-8-8	2	SHEET	1 of 15		
PROJECT						R ESTIMATE		
HORTH WEST BOUNDA	KY 60	11 TA	ATH	NT/ = U75917=N		CODE A (No design		
ROCKY MOUNTAIN LASEN	AL	100	. /	297 2 (2000)	DDE B (Proliminary of CODE C (Final dec			
ARCHITECT ENGINEER STEAR	NS - R	0G E	r	26616 OTHER (Specify)				
DRAWING NO.		ESTIM	ATOR	Fu		CHECKED BY	4. (
	QUANT	ITY		LABOR M.H		MATERIAL	A	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	TOTAL COST	
N	BHAI	VICA	16	WURK			·	
PIPE DUC.								
SCH 80								
I DIA	10	LF	.24,	2.4	,26	2.6		
11/2 " DIA	30	LF	.31	7.3	. 44	13.20		
24 DIA	130	LF	.36	64.8	.60	108.00		
						_		
A" DIA	165	LF	.48	70.2	1.80	197.00		
		_		10 12 00	0 1.11	777.44		
6" DIA	226	LF	. 57	128.82	3,44	1714		
∂ 514	40	LF	. 73	29.2	T // 2	200.20		
5 5 5	40		1 1 3	57.2	4,23	100,50		
10" 314	20	LF	. 23	16.60	7.75	55.00		
12" DIA	74	LF	. 06	71.04	10.67	-79.58		
		}		401-36		2352.02		

CONSTRUCTION COST	TE	DATE PREPARED 7-8-82 SHEET 2 OF 15							
PROJECT				BASIS FOR ESTIMATE					
LOCATION					1 . —	CODE A (No designable of the contract of the c	·		
ARCHITECT ENGINEER					CODE C (Final design)				
					°	OTHER (Specify)			
DRAWING NO.		ESTIM	ATOR	Fy		CHECKED BY			
	QUANT			LABOR M.H.		MATERIAL	TOTAL		
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST		
PUE FITTINGS	Sc#	80		401.36		2352.02			
DO ELL (SLIP)									
11/2" DIA	Q	EA	.62	4.96	2.14	17.12			
	<u> </u>								
LU DIA	30	EA	.73	21.90	2.92	17.50			
4" DIA	20	EA	1.33	25.10	15.63	312.60			
6 DIA	14	EA	2.19	74.96	35.65	255.60			
12 DIA	4	EA	4.8	19.20	214.47	257.92			
		ļ							
		<u> </u>							
45° ELL (SLIP)									
		ļ							
24 DIA	10	EA	.73	7.3	2,02	29.20			
0.12	1.4	-							
4º DIA	12	EA	1.33	15.06	13.27	1.79.36			
		ļ							
(6		-							
- BE (SUP)		-							
		-	1 44	11.00					
LY DIA	10	EA	1.14	11.40	3.39	33.90			
4 DIA	1 14	EA	2	Ru	1-1	307.20			
4 DIA	! 2	12 14		,,,,	V 3 100	301.60			
6° 71A	9	EI	3.2	28.2	-1.12	461.07			
			<u> </u>	<u> </u>					
10" DIA	1	EΔ	4.8	U.8	99.92	99.92			
				621.24		5 5 7 3 5/			

CONSTRUCTION COST	TE	DATE PREPARED			3 of 15				
PROJECT						R ESTIMATE			
LOCATION					CODE A (No design completed) CODE B (Preliminary design)				
ARCHITECT ENGINEER					CODE C (Final design)				
ARCHITECT ENGINEER					OTHER (Specify)				
DRAWING NO.		ESTIM	ATOR	tu	CHECKED BY				
	QUANT	ITY		LABOR H.H.		MATERIAL			
SUMMARY	NO. UNITS	UNIT	PER Unit	TOTAL	PER Unit	TOTAL	COST		
				221.24		5573.51			
12" DIA	1	EA	6.0	6.00	150.24	150,24			
COUPLINGS (LL12									
2" DIA	20	EΔ	.73	14.60	1.38	47.60			
5 5 14			· '-						
A" DIA	15	EA	1.33	10,0-	0 8/	147.90			
		-	1.55		700				
6 DIA	20	ĒΑ	2.30	46.00	1027	307.40			
G 904	20	C /4	6,30	- 5.00	13737	957.70	-		
3" >1+	<u></u>	1 ft	3.0	(2) 0	37.73	2 26.38			
5 5 5			7.0	• 0	٠/ . ال	2 26.33			
12 314	\ n	= 1	// -	UB.0	20 41	353.28			
	12	EA	4.0	98.0	6-7079	3 4 5 . 68			
7 =									
REDUCER BUSHIN	<u> </u>								
(SPIGK SLIP)									
7		- 1		,	100	,07			
O'XB" DIA	3	EA	3,5	[0.5	62.21	186.63			
,						·			
12 NB DIA		EA	4.00	4.0	132.14	132.14			
									
12 × 10 DIA	1		4.00		99.54	99.54			
6" x 4" DIA	G	EA	2.30		12.20				
				806.09		7 297.82	,		

CONSTRUCTION COST		DATE PREPARED SHEET 4 OF			7 of 15			
PROJECT					BASIS FO	R ESTIM	ATE	
LOCATION	· · · · · ·				CODE A (No design completed) ☑ CODE 8 (Preliminary design)			
					CODE & (Preliminary design) CODE C (Final design)			
ARCHITECT ENGINEER					OTHER (Specity)			
DRAWING NO.		ESTIM	ATOR	FK	CHECKED BY			
	QUANT	QUANTITY		LABOR M.H.		AATERIA		TOTAL
SUMMARY	NO. UNITS	UNIT	PER	TOTAL	PER	70	TAL	COST
REDUCING				806.09		72	97.82	
REDUCING (SLIP)								
B 16" DIA	3	EΔ	3.0	9.0	21.28	6	3.84	
10' K 8' DIA	1	EA	3.2	3.2	24.24	e	4.24	
6x4" DIA	6	EA	2.3	13.80	12.20	-	13.20	
		-						-
		-			<u> </u>			
·								
		-				-		
	<u> </u>							
		-						
		+						
		+				 		
		+						
		+						
		+						
		+						
		 						
		1						
		1						
				\$ 32.09		74	59:10	

CONSTRUCTION COST	ESTIMA.	TE		DATE PREPARED			5 of 15		
PROJECT					BASIS FO	RESTIMATE			
LOCATION					CODE A (No design completed) CODE B (Preliminary design)				
ARCHITECT ENGINEER					CODE C (Final design)				
	-				OTHER (Specify)				
DRAWING NO.		ESTIM	ATOR	=4		CHECKED BY			
	QUANT			LABOR M.H.		ATERIAL	TOTAL		
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER UNIT	TOTAL	COST		
				832.09		7,459.10			
FLANCE IN PUC									
150 DRILLING									
SLIP TYPE SCHBO									
2"DIA	10	EA	.40	4.0	4.80	48.00			
					<u> </u>				
21/2 514		EA	.46	,46	10.14	10.14			
		1			<u> </u>				
	ļ , —				<u> </u>				
4" DIA	60	EA	. 66	39.6	16.04	962.60			
		1							
		1							
6 DIA	76	EA	, 24	63.84	20.01	1591.44			
		-			 				
, o b	-	+	·	7 00	/ . 30	100 21			
12" DIA	2	EA	1.5	3.00	66.78	133.56			
	-	+	 						
	-	+			 				
	<u> </u>	+				`			
	 	+							
		+							
	 	+	†						
•	 	+							
	 	1							
	 	+							
	 	1	†						
	<u> </u>	1							
: /		1		942.99		10204.64			

CONSTRUCTION COST	TE		DATE PREPARED	SHEET 6 OF 15				
PROJECT						R ESTIMATE		
LOCATION					CODE A (No design completed) CODE B (Preliminary design)			
ARCHITECT ENGINEER					CODE C (Final design)			
DRAWING NO.		ESTIM	ATOR	<u></u>		CHECKED BY (
DAAWING NO.		[EPANK LABOR M.H.		' 1	now ly	
	QUANT	T				AATERIAL	TOTAL	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL MH	PER	TOTAL	COST	
OPW ADAPTOR-633F		ļ		942.99		10204.64		
MALE TYPE W/N.P.T.								
MATERIAL - ALUM.	.,	ļ						
W/VITON A-GASKET	•							
4"	2	EA	2.9	5.8	5604	112.08		
22	/	EA	1.6	1.6	21.22	21.22	4	
		-						
004/ 110/010								
OPW CAP-634B	,							
FOR USE WADAPTOR MITTERIAL -ALUM.	3							
W/VITON A-GASKET								
7								
4"	Z	GA	1.5	3.0	18.84	97.63		
		ļ						
21/2"		EA	1.0	1.0	28.04	28.04		
							·	
		-						
		-						
							<u> </u>	
			 					
				954.39		10 463.66		

CONSTRUCTION COST	ΓE	DATE PREPARED	32	SHEET	of 15				
PROJECT ·					BASIS FOR ESTIMATE				
LOCATION						CODE A (No design			
					CODE & (Preliminary design)				
ARCHITECT ENGINEER					OTHER (Specify)				
DRAWING NO.		ESTIM	ATOR K		CHECKED BY				
	QUANT	·		LABOR MH.		MATERIAL			
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST		
				954.39		10463.66			
BUTTERFLY VALUE									
IN PUC WAFFER		ļ			<u> </u>				
TYPE WITH METAL									
HANDLE 4" DIA	17	EA	2.82	47.94	101.70	1724.9			
TYPE WITH METAL HANDLE A' DIA (+GF+#367)									
	-	<u> </u>			1///	262.6			
DITTO G" DIA	6	EA	3.3	10,80	161.10	966.60			
BALL VALUE									
IN PUC SINCLE									
IN PUC SINGLE UNION VITON SEAL IV DIA					ļ <u></u>				
1 DIA	6	EA	. 35	2.10	23.13	137.77			
(GF #345)					<u> </u>		-		
				1 u.	37.94	- 0 /0*			
DITTO 1/2 DIA	6	EA	, 40	2.40	3127	217.04			
	-	 							
	\vdash	1							
	<u> </u>								
SWING CHECK									
VALUE IN PUC									
W/ DISC SEAT AND									
SPRING BALANCED					<u> </u>				
DISC FLANGED									
4° DIA	1	EA	3.25	3.25	550.	550. [∞]			
(PPS FIG 0841342)				1 1 2 2 2 7	ļ	111255			
	1	1	<u> </u>	1029.88		14075.58			

CONSTRUCTION COST	STIMAT	ΓE		DATE PREPARED	-	SHEET	3 or 15
PROJECT				1-1-60	BASIS FOR ESTI		
LOCATION					CODE B	A (No design Preliminary de C (Final desi	ealgn)
ARCHITECT ENGINEER					OTHER (S	pe cify)	Toule
DRAWING NO.		ESTIM	ATOR	=u	CHECK	ED BY	ĺ
	QUANT	ITY	<u> </u>	LABOR M.H.	MATERI	AL	<u> </u>
SUMMARY	NO.	UNIT MEAS.	PER	TOTAL	TINU	DTAL	COST
				102988	1050-	075.5K	-
DITTO 6" DIA	4	EA	4.95	19.80	1050 -	4200°	
BALL VALUE IN PVC							
COMPACT W/VITOH							
SEAL 2" DIA							
(GF# 550)	3	EA	, 47	1.41	30,60	91.20	
		<u> </u>					
		-					
		ļ					
		ļ					
		 					
		-					
		 					
		┼—					
		 					
			 	105 E.09	18	367.38	

CONSTRUCTION COST		DATE PREPARED SHEET 9 OF			15				
PROJECT			· · · · · · · · · · · · · · · · · · ·		BASIS FOR ESTIMATE				
LOCATION					CODE A (No design completed)				
					CODE 6 (Preliminary design)				
ARCHITECT ENGINEER					OTHER (Specity)				
DRAWING NO.		ESTIM	ATOR		٠.	CHECKE	DBY		
			1	LABOR M.H.			- 1 h	my !	
SUMMARY	QUANT	UNIT	PER	TOTAL	PER	MATERIA	TAL		TAL OST
	UNITS	MEAS.	UNIT		UNIT	<u> </u>			
		<u> </u>		1051.09		1836	7.38	·	
PRESSURE GAGE									
ASS'Y CONSISTING		ļ							
of PVC INSTRUMENT		-							
TEP 2 GLOBE VALUES 1/4"		ļ							
VAL VES 14"		ļ							
FITTILE, S.									
CAGE GARD &		ļ							
PRESSURE GAGE				ļ					
FOR 2' DIA PIPE	2	EA	5.0	'0	66.00		13200		
		ļ							
							<u>-</u>		
DITTO FOR 6 PIPE	3_	EA	5.2	15.6	7000	!	21000		
									<u> </u>
VALUES - FLOW RATE	·								
CONTROL									
TRIM, INCL. PILOT									
TRIM, INCL. PILOT									
GORIFICE									
G" DIA FLIXNGED									
FLUNGED	3	EA	ව	24	17760		328.		
·									
									· ·
				1100.69		240	37.38		

CONSTRUCTION COST	DATE PREPARED	0 of 15						
PROJECT						RESTIMATE		
LOCATION					. —	CODE A (No design DE B (Preliminary d		
					CODE C (Final design)			
ARCHITECT ENGINEER					□ °™	HER (Specify)		
DRAWING NO.		EST IM	ATOR	FK		CHECKED BY	rounte.	
	QUANT	ΤΥ		LABOR H.H.	M	IATERIAL	TOTAL	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST	
				1100,69		24 037.38		
PIPE LARBOU								
STEEL, SCH. 40, POLY-								
PROPYLEH LINED,								
FLANGED, SHOP								
PREFAB IN SPOOLS							<u> </u>	
(6' LONG PES)		1,-	20	1052=	1401	4025.70		
(b LONG PE)	270	LE	,39	<i>, , , , , , , , , , , , , , , , , , , </i>	7.71			
4" DIA	35	LF	-69	24,15	29.33	1026.55		
4" DIA (6' LOVE PES)								
	<u> </u>	<u> </u>						
		ļ						
FITTINGS E.T.								
POLY P. ROPYLEN	<u> </u>	<u> </u>			<u> </u>			
LINED FLAHGED		<u> </u>						
150#	1	1,	, , , =		7- 9.	220.30		
TEE 2 DIA	4	EV	1.45	5.80	70.20	200.		
		\vdash			 			
90°ELL 2" DIA	12	EA	,89	10.68	51.30	61.60		
10 2 2 2 0 7 17		-	1.07	, , , , ,	 			
		†						
47 ELL 2° DIA	5	EA	.89	4.45	63.90	319.50		
				1251.07		30305.53		

CONSTRUCTION COST	TE	DATE PREPARED	1-82	SHEET	11 of 15				
PROJECT						R ESTIMATE			
LOCATION						CODE A (No design DE B (Preliminary o			
ARCHITECT ENGINEER					CODE C (Final design)				
		1							
DRAWING NO.		ESTIM	ATOR	FX		CHECKED BY			
	QUANT	1		LABOR M.H.		MATERIAL	TOTAL		
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST		
				1251.07		30 305,53			
90° ELL 4" DIA	8	EA	2.47	21.36	80,10	712.80			
		-							
		-							
WALUES DIGO		-							
VALUES PLUG		1							
e.s BODY POLY PROPYLEN		 							
LIMED, FLUNCED		 							
1.0 = ZATING		†							
2º DIA	8	EA	1.00	8.00	446.40	3.71.2	b		
		ļ							
		_							
		1							
VALUES BALL		ļ							
e.s. Tody		<u> </u>							
POLYPROPYLEN		ļ							
LINED FLANGED		_		•					
e.S. TYODY POLYPROPYLEN LINED FLANGED 150 RATING L' DIA		<u> </u>			272.0	2616.00			
U DIA	_3_	EA	1.00	3.00	8/2,	2010.			
		<u> </u>							
		-			-				
		-		1283:43		37205,53			
		1	1	11602112		11000,23	l		

CONSTRUCTION COST	TE		DATE PREPARED	2 of 15				
PROJECT					BASIS FO	RESTIMATE		
LOCATION						CODE A (No design		
					CODE & (Preliminary design) CODE C (Final design)			
ARCHITECT ENGINEER					_ or	HER (Specify)		
DRAWING NO.		ESTIMATOR		FK		CHECKED BY	1 L. ly	
	QUANT	ITY		LABOR H.H.	M	ATERIAL	TOTAL	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER UNIT	TOTAL	COST	
				1283.43		3720553		
PIPE ELZZON STEEL							·	
SCH BU YOCKET								
WELDED								
(COMPRESSED AIR								
SYSTEM)								
,		ļ						
2" DIA	60	LF	,26	15.60	4.40	264.00		
VALUES CLOBE								
BRONZE DEREWED		ļ						
BRONZE SCREWED								
SERVICE		<u> </u>						
2° DIA	3	EΔ	.73	2.19	80.00	240.00		
		-			<u> </u>			
		<u> </u>			ļ			
		ļ	ļ					
VALVES GATE								
BRONZE SCREWED		 						
EHDS 150#	<u> </u>				 			
	ļ	 						
2° D(A	2	EY	,73	1.46	42.00	84.00		
	<u> </u>	-	ļ	12.2.6	<u> </u>	177816		
		1	1	1302.68		37 793.53		

CONSTRUCTION COST		DATE PREPARED		SHEET	13 or 15			
PROJECT					BASIS F	OR ESTIMATE		
LOCATION						CODE A (No designos)		
ARCHITECT ENGINEER					CODE C (Final dealgn)			
					Ö	THER (Specify)		
DRAWING NO.		ESTIM	ATOR	Fu		JMC CHECKED BY		
	QUANT			LABOR H.H	·	MATERIAL T	TOTAL	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST	
ADDITIONAL				1302.68		37.793.	53	
VINGERS & SUPPO	275							
<u>'</u>								
	1200	16		10.00	.6.	780		
BOLTING MATERIAL						1200		
FLOW MONITOR-POS. DIS	عانم							
	3				1300	3900,-		
			M.t	1. 1312.68		\$43.673.5	13	
PIPING TOTAL:								
LABOR	M.H							
	1312.68		@	24.42	=	H	32055:65	
HATERIAL						¥	43673.53	
		<u> </u>				<u> </u>		
					ļ			
					<u> </u>			

CONSTRUCTION COST		DATE PREPARED	14 of 15.					
PROJECT					BASIS FOR ESTIMATE			
LOCATION							(No designary c	n completed) lesign)
ARCHITECT ENGINEER] CODE 0	(Final des	
·					Ů	THER (Sp		
DRAWING NO.		ESTIMATOR FU			CHECKE	2		
	QUANT	QUANTITY		LABOR MH,		MATERIAL		
SUMMARY	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER	70	TAL	TOTAL COST
		ļ				<u> </u>		
						<u>.</u>		
		 				<u> </u>		
		-						
EXCAVATION				·		-		
0 \								
20FT LONG, 4FT		20	1/	07.00				
DEEP SFT WIDE	23.7	Y480	1.0	37.92				
BACK FILL	23.7	e u YARD	. 80	18.96				
							/i	
TOTA L	,		15.41	56.88			B	876.52
					<u> </u>			
•		1				<u> </u>		

CONSTRUCTION COST	CONSTRUCTION COST ESTIMATE						5 of 15	
PROJECT					BASIS FO	OR ESTIMATE		
LOCATION						CODE A (No design		
		<u></u>			_	CODE C (Final dee		
ARCHITECT ENGINEER					OTHER (Specify)			
DRAWING NO.		ESTIM	ATOR	Fa		CHECKED BY		
	QUANT	ITY		LABOR		MATERIAL	TOTAL	
SUMMARY	NO. UNITS	UNIT MEAS.	PER	TOTAL	PER	TOTAL	COST	
		<u> </u>						
SUMMARY	:							
PIPING LAB	0e			32055;65	1			
PIPING LAB	Z/A	4				43673.53	/	
	<u> </u>	ļ				j		
		-						
		-						
PLUMBING LABO								
LABO	R			2886.93				
MATE	2146	ļ				1612,48		
	ļ	-						
LUAE								
LABO?		-		3015,87	-	111-00		
YATE	12/12	-	 		-	4645.90		
EXEAU & BACKFIL	4							
LABOR	4		<u> </u>	876.52	1			
SUBTOTAL	ļ				-		`	
	-	-		206240-	-	11002191	88766.88	
TOTAL	1	1	1	38834.97	1	17-17-131-31	10100.08	

CONSTRUCTION COST	Έ		DATE PREPARED 7-13-	82	SHEET	1 of 3			
PROJECT NORTHWEST BOU	NDAR	<i>y</i>		I	BASIS FO	R ESTIMATE			
CONTAINMENT/TRO	EATME	NT	5451	EM	CODE A (No design completed)				
RMA - COMME					CODE & (Preliminary design)				
ARCHITECT ENGINEER STEARNS-ROGE		<u> </u>			OTHER (Specify)				
DRAWING NO.	-/_	EST IM	ATOR 1	JEW		CHECKED BY			
	QUANTI	L		LABOR	MATERIAL				
ELECTRICAL SUMMARY	NO. UNITS	UNIT MEAS.	PER Unit	TOTAL	PER UNIT	TOTAL	TOTAL COST		
LIGHTING FIXTURES	SHEET	2		1359		1325			
DISTRIBUTION	71	2		2712		10450			
DEVICES	/1	2		230		706			
LIGHTNING PROTECTION	/1	2		2885		1788			
GROUND GRID	1/	3		2835.		1230			
WIRE & CONDUIT	"	3		7074		2277			
MOTOR & CONTROL	11	3		576		─	70-11-		
TOTAL BARE COST =			,	17,671		77,776	\$35,447		
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CONSTRUCTION COST	ESTIMAT	Έ		9-9-82	4	SHEET	2 of 3	
PROJECT NORTHWEST	BOUN	DAI	ey		BASIS FO	R ESTIMATE		
CONTAINMENT/T					CODE A (No design completed)			
RMA - COMM	ERCE		ITY_	COLO CODE C (Finel design)				
ARCHITECT ENGINEER STEARNS-ROGER	;				OTHER (Specify)			
DRAWING NO.		ESTIM	ATOR W.	E·W.		CHECKED BY	41	
TIFITBIE A1	QUANTI	TY		LABOR		ATERIAL	TOTAL	
ELECTRICAL SUMMARY	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER	TOTAL	COST	
LIGHTING FIXTURES			\$		<i>I</i>	0 - 0	Contraction	
150W HPS	0	EA	180	1080	150	900		
COE TYPE WB-I FIXT	1	EA	60	60	40	40		
EXIT SIGN W/POWER PACK	D /	EA	53	53	250	250		
COE TYPE R-2D FIXT.	1	ΞA	53	53	15	15		
COE TYPE VG-4	1	ĒΑ	53	53	45	45		
RECESSED HEAT LAMP FOR LAVRATORY	1	EA	60	, 60	75	, 75		
DISTRIBUTION			,	1359		\$1325		
20 CKT LTG PNL.	1	EA	600	600	950	950		
IOKVA DRY-TYPE TRANS	1	ΞA	312	312	500	500		
MCC, 3-VERT. SECT.	1	EA	1800	1800	9000			
				\$ 2,712		\$10450		
DEVICES								
SWITCH-BOX-COVER	4	EA	12	48	40	160		
DUPLEX RELP-BOX-COVER	13	EA	14	182	42	546		
				\$ 230		\$ 706		
LIGHTNING PROT.								
CADWELDS & MISC.	50	EA			3	150		
CLASS I CONDUCTOR	400	FT				400		
CU AIR TERMINALS	12	EA			5	60		
POINT BASES	12	EA			17	204		
CABLE HOLDERS	130	EA			2	260		
GROUND RODS	6	EA			30	180		
ADHESIVE FOR AIR TERM. F HOLDERS	I	GAL			34	510		
CABLE SPLICERS		EA			6	24		
						\$1788		
LABOR	JOB	120	24.04	2,885				
		, 17.	1	1 7 7		* U.S. GOVERNMENT PRINT	INC. OFFICE . 1999 0-5161	

CONSTRUCTION COST	ΓΕ	DATE PREPARED 7-12-82 SHEET 3 OF			T 3 OF 3			
PROJECT NORTHWEST E		BASIS FOR ESTIMATE						
CONTAINMENT/T	REAT	ME	NT S	YSTEM	CODE A (No design completed)			
LOCATION RMA - COMME ARCHITECT ENGINEER					CODE & (Preliminary design) CODE C (Final design)			
ARCHITECT ENGINEER STEARNS-ROGE			7		OTHER (Specify)			
DRAWING NO.	<u> </u>	ESTIM	IATOR Z	EW		CHECKED BY	941	
	QUANT	ITY	Γ	LABOR	Ι ,	MATERIAL		
ELECTRICAL SUMMARY	NO. UNITS	UNIT	PER	TOTAL	PER UNIT	TOTAL	TOTAL	
GROUND GRID			&		##			
#2/050BC CROSS-RUN				312	1.35	270	7	
#4/0 SDBC PERIM. RUN				576	2.20	660		
BOLTED CONNS. ABOVE GRACE	FJOB	HRS	24.04	1442	45	100		
CADWELD CONNS EMISC	JOB	HRS	24.04	50 5	<i>L</i> 5	, 200	2	
				2 <i>8</i> 3 <i>5</i>		\$ 1230	· c	
WIRE & CONDUIT								
3" RGS CONDUIT & FITTINGS	100	LF	12	1200	4.50	45	0	
12" RGS " "	200	LF	5.75	1150	1.55	310	Ø	
1" RGS (TEL. CONDUIT)	60	LF	3.60	216	1-00	6	0	
3/4" RGS CONDUIT & FITTINGS	1000	LF	3.35	3350	0.80	80	0	
I" RGS CONDUIT & FITT-	50	4=	3.60	180	1.00	5	0	
1/2"LIQUIDTIGHT FLEX	24	25	7.90	190	5.00	12	0	
3/4" " "	12	1 /=	3,60	43	1.90	2	3	
WIRE, THAN-THWN:						-		
# GAWG	800			240				
#10 AWG	1000			220		/ 2 :	2	
#12 AWG	1500	LF	0.19	<u> </u>	0.08	120		
				\$7074		4227	7 ~	
MOTOR & CONTROL		12-	A 1 2 4 4					
MOTOR HOOKUP	SOB			288	*	MATERIA	4	
CONTROL CKT HOOKUP	JOB	HRS	24.04	288	_	ABOVE		
				\$576			V	
				<u> </u>				



ARMCO BUILDING SYSTEMS

J. SHELBY WELCH, JR. District Manager

July 7, 1982

Stearns Roger Engineering Corporation P. O. Box 5888
Denver, Colorado 80217

Attention: Mr. Steve Van Winkle

Reference: Northwest Boundary Ground Water Control System

Rocky Mountain Arsenal Project No. C26616

Gentlemen:

In accordance with your request, we are pleased to submit for your consideration the following estimate for the above referred to project:

One complete Armco building, type RF-80, size 40'-0" wide x 72'-8" long x 30' high, designed for 30# LL and 25# WL per UBC. The roof panels to be 24 gage ALUMINIZED steel with standing seams and concealed fasteners. The wall panels to be 24 gage galvanized steel with interlocking ribs, concealed fasteners and factory finish color coating with a 20 year warranty. Both endwalls to be designed for future expansion. The following accessories are included:

- 3 3070 single swing steel doors with top half glazed and necessary hardware
- 1 10' x 14' overhead sectional steel door insulated
- 1 12' x 24' overhead sectional steel door insulated
- 1 30' length of 12" throat ridge vent with damper and birdscreen
 - Gutters and downspouts for both side walls
 - Roof insulated with 3" fiberglass blanket to meet U factor of 0.10
 - Walls insulated with 3" fiberglass batts to meet U factor of 0.15
 - Steeliner to protect insulation up to 8' high around perimeter of building

All of the above delivered and erected on foundation by others for the sum of\$63,000.00

At the present time and subject to prior orders received, shipment can be made in approximately six weeks.

Stearns Roger Engineering Corporation July 7, 1982 Page 2

We thank you for the opportunity to present this information. Please contact me if you have further questions.

Cordially,

JSW:mp

Enclosures

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•			,
AR	M V	C	O

ARMCO BUILDING SYSTEMS

J. SHELBY WELCH, JR. District Manager

July 8, 1982

REFER TO		NOTE
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-	1982	
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Gen. Files		-
ANS'D		

Stew Van

Stearns Roger Engineering Corporation P. O. Box 5888 Denver, Colorado 80217

Attention: Mr. Steve Van Winkle

Reference: Northwest Boundary Ground Water Control System

Rocky Mountain Arsenal Project No. C26616

Gentlemen:

Supplementing our letter of July 7, please be advised that to increase the length of building to 77'-8" (3 bays @ 25') the cost would be increased by \$1300.00.

Cordially,

JSW:mp

QUOTATION GGOULDS PUMPS, INC.

VERTICAL SUMP PUMP

To: Rubel and Hager, Inc.

4400 E. Broadway

REPLY TO:

PIONEER EQUIPMENT, INC. P.O. Box 27024 Tucson, AZ 85726

Proposal No.:

Attn: Dick Cahill

All quotations subject to terms and conditions on the reverse side and expire

unless accepted within 30 days from date of quotation. All quotations subject to change with or without notice. Date: 7/8/82 Page:

	Iucs	011, 7	14 0	3/11		Revision No.:				
Attention:			rick	-	Jr., P.E.		Goulds		Denve	
Inquiry Date:	7/8/				P-10	1.102.				
Inquiry No.:	Rocky	Mr. A	rsen	al Ite	m No.:	1,102; 3,104.	Pioneer	Equip,	Phoen	ix
In answer to	nour in	auiru.	we m	opose to	furnish GOU	ULDS PUMPS	as describe	d below:		
CONDITIONS				·	<i>j</i>					
LIQUID		ter								
G.P.M.	500		Sn (ar.∉ 60°F	1.0	PH Value			Solids %_	
T.D.H.	160					Abrasives.		So	lids Size_	
Pumping Temp.										
PUMP DESCR	RIPTION -		Stea	dy Bearing		CONTROL EQUIP	MENT:			
QUANTITY	44			ication _			_	E	fficiency_	71.5
MODEL	3171		Su	oport Plate_	Std.	Float Switch =		В.Н.Р	Rating_	28.8
Size	3X4-13			Pit Cover_	None	Alternator =		Ma:	x. B.H.P	32.3
Group	, <u>M</u>		s, c		Cast iron	Hi Water Alarm = .	None			
Pit Type	★ Wet	⊡ Dry	RIAL A	Impeller_	Cast iron	Single Cont. Voits	<u>None</u>	_		
Pit Depth	, 12 ft	0.	MATE.	Shaft_	Steel	Mag. Start Size	<u>None</u>	_	R DIAMET	
Assembly No	22		₹ \Ste	ady Brngs	Carbon	NEMA Enct.	4	Approx :	Rating_	12.5
	For detailed	specific	cations s	ee Builetin	726.1	Curve No.	1182-3	Mir	. / Max	<u>10 / 13</u>
DRIVER -										
	40				1750	Phase/ Hz	3/60		1/-14-	230/460
ΗP	1.15/	SE		R.P.M.	R		204			Goulds
Enclosure	1.10/			Insulation		Frame	<u> </u>	Furn	isned by _	000103
UNIT PRICES	- '						•	PRICES ARE	F.O.B. Lt	JBBOCK, TEXA
PEMP SEPP	OPT PLATE	and CO	HPLING	s		Weight, pounds:		Pre-	paid j	ob site
10411 3011	On CANC	3, 1. 00				.				
COMPLET	E PRICE	EACH	 {					SHIPMENT:	6-8	_weeks_after
					5,332.00		1926			and manu-
								facturing in	formation	and full ap-
								provai to pro	sceed with	work.
DRIVER										
FREIGHT (est										
			TY F	OUR	21,328.00	TOTAL WEIGHT	7704	TERM	4S. 30 DA	YS NET

PIONEER EQUIPMENT, INC.

TERMS, 30 DAYS NET PER APPROVED CREDIT

Richard J. Cahill Sales Representative

FILTEMP SALES, INC.

filtration • flow • heat • control

5-101 A,B 5-102 A,B 5-103 A,B

MAILING ADDRESS: P.O. BOX 15173 PHOENIX, ARIZONA 85060

July 8, 1982

OFFICE: 3601 S. 42ND STREET PHOENIX, ARIZONA 85040

RECEIVED

Rubel & Hager 4400 E. Broadway, Suite 602 Tucson, Arizona 85711

JUL 12 1982

RUBEL & HAGER, INC.

Attention: Mr. Fred Rubel

Reference: Rocky Mountain Arsenal

Northwest Boundary Treatment System

Dear Mr. Rubel:

We are pleased to quote the following Filterite Equipment per your request.

A Qty

<u>C</u>

6 Filterite Model 66MSO3-316-4FD-C150
Code Vessel - 316SS - 150 # Operating Pressure
1" NPT Vent - 1 1/2 " NPT Drain - 316SS
Top Seat Plate & Springs - Ethylene Propylene
Gasket - "UM" stamp standard - includes eye nuts Houses 22-30" cartridges - See Bulletin 1762.

Price each: \$4,550.00 Qty--6 at:\$ 27,300.00 Est Frt - Total: \$580.00

6 Sets of Cart (U100AW30U) : \$800.00

Total Cost: \$28,680.00

Option <u>B</u> same as item A except Vessel is 304SS instead of 316SS.

Price each: \$3,761.00 Qty--6 at: \$22,566.00 Est Frt - Total: \$580.00

6 Sets of Cart (U100AU30U) : \$800.00

Total Cost: \$23,946.00

Replacement Cartridges

Filterite U100AW30U 100 Micron - 30" length - Polypropylene Core and Polypropylene Wind July 8, 1982 Rubel & Hager Page 2

Lot Price, 150 Cart : \$975.00 F.O.B. Phoenix

Both Item A and Item B include non code stamp at no additional charge. If you require "U" stamp then please add \$250.00 to total cost. In my opinion the "UM" stamp is more than sufficient. Please contact our office if we can provide further information.

Sincerely,

George R. Metro Filtemp Sales, Inc.

nam

Westvāco

July 9, 1982

Mr. Fred Rubel Rubel & Hager, Inc. 4400 E. Broadway, Suite 602 Tucson, AZ 85711

Dear Fred:

In accordance with your request, I have enclosed a proposal for a Westvaco Pulsed Bed Adsorption System for the Northwest Boundary Containment Treatment Facility, Rocky Mountain Arsenal. Included is a budget estimate of the uninstalled cost of this equipment.

If you require further information or details, please contact me.

Sincerely yours,

Michael L. Massey, Ph.D., P.E. Manager, Carbon Systems

MLM/sa Enclosure

Chemical Division
Carbon Department
Covington, Virginia 24426
Telephone: 703-962-1121

PROPOSAL FOR A WESTVACO PULSED BED ADSORPTION SYSTEM

PROVIDED BY

WESTVACO CORPORATION
CARBON DEPARTMENT
CARBON SYSTEMS GROUP
COVINGTON, VIRGINIA 24426

FOR

ROCKY MOUNTAIN ARSENAL

NW BOUNDARY TREATMENT SYSTEM

COMMERCE CITY, COLORADO

JULY 9, 1982

Introduction

Westvaco has been requested to prepare a proposal, including budget estimate, for a Westvaco Pulsed Bed Adsorption System. This system will provide carbon adsorption treatment of groundwater at the proposed NW Boundary project at Rocky Mountain Arsenal, Commerce City, CO.

The treatment process will consist of the following:

- A. Three standard pulsed bed adsorption columns.
- B. Two carbon storage tanks, one for fresh carbon and one for spent carbon.
- C. A dual blowcase assembly for carbon transport.
- D. 150,000 pounds of virgin carbon, Nuchar WV-G.

The price covers the cost of delivery of assembled treatment modules as described in the process description. It does not cover the cost of on-site installation. Details of the proposed system are as follows:

Process Description

The Westvaco Pulsed Bed Adsorption System shall include the following standard Westvaco components as required by the specifications:

A. Adsorption Unit

- 1. The carbon adsorption system shall be three upflow Pulsed Bed Systems as manufactured by Westvaco.
- Each 42,000 lb contactor unit shall be a ten-foot diameter 1400 cu ft capacity ASME 50 psig Design Pressure Vessel with potable water lining.
- 3. Influent and effluent connections shall be designed to insure even flow distribution.

- 4. Each adsorber shall be mounted on a support structure designed to support the contactor and all piping and attached equipment under all operating conditions. The support structure shall be designed to provide ready access to piping and valves.
- 5. Connections to each adsorber shall be as follows:
 - a. Raw water inlet and treated water outlets shall be four 6-inch connections.
 - b. Fresh carbon inlet and spent carbon outlet connections shall be 2-inch and properly designed to facilitate carbon handling.
 - c. Three 1/2-inch 316SS sample nozzles are to be spaced at the quarter points of the adsorber, with the nozzle penetrating 6 inches into the carbon bed.
- 6. Each adsorber shall be furnished with two 20-inch diameter manholes—one manhole to be located on the top of the vessel and the other on the side near the bottom of the vessel. An access ladder in conformance with applicable safety standards shall be provided for the top manhole.
- B. Fresh Carbon Storage Tank
 - 1. One ten-foot diameter 740 cu ft capacity fresh carbon storage tank shall be provided. The tank will be an open top cone-bottom vessel suitable for storing a minimum of 20,000 lb (dry weight) of spent carbon. A full water level will be maintained in the tank by a float valve.
 - 2. The tank shall be of all-welded carbon steel construction with potable water lining.
 - 3. The structure and baseplate shall be designed to support the tank, tank contents, and attached equipment under all operating conditions. Lugs, adequate for all lifting and moving the tank, shall be provided.

- 4. Connections to the fresh carbon storage tank shall be as follows:
 - a. The bottom carbon outlet shall be 4-inch diameter (minimum)
 - b. A 2-inch diameter raw water connection
 - c. The tank overflow shall be 4-inch diameter and shall be located above the normal liquid level. The outlet shall be screened to prevent loss of activated carbon.
- C. Spent Carbon Storage Tank
 - 1. One ten-foot diameter 740 cu ft capacity spent carbon storage tank shall be provided. The tank will be an open top cone bottom vessel suitable for storing a minimum of 20,000 lb (dry weight) of spent carbon. A full water level will be maintained in the tank by a float valve. Removal of spent carbon will be by the use of an eductor.
 - 2. The tank shall be all-welded carbon steel construction with potable water lining.
 - 3. The structure and baseplate shall be designed to support the tank, tank contents, and attached equipment under all operating conditions. Lugs, adequate for all lifting and moving of the tank, shall be provided.
 - 4. Connections to the spent carbon storage tank shall be as follows:
 - a. The bottom carbon outlet shall be 4-inch diameter (minimum)
 - b. A 4-inch diameter raw water connection
 - c. The tank overflow shall be 4-inch diameter and shall be located above the normal liquid level. The outlet shall be screened to prevent loss of activated carbon.

D. Carbon Transport System

- 1. The carbon transport system shall consist of separate fresh and spent carbon blowcases to transfer carbon slurry from the fresh carbon storage tank to each adsorber unit and from each adsorber unit to the spent carbon storage tank. Carbon transport will be by air pressurization and eductors. Normal pulsing operation will consist of transporting 2,000 lb of dry carbon per cycle.
- 2. The blowcases shall be 70 cu ft capacity ASME 50 psig Design Pressure Vessels. All wetted parts of the vessels shall be 316 L stainless steel. The pressure vessels shall be stamped in compliance with ASME Code.
- 3. A common support structure and baseplate shall be provided for the two blowcases. The support structure and baseplate shall be designed to support the blowcases, contents, and all attached piping and appurtenances under all operating conditions. The support structure shall be carbon steel. Lifting lugs, adequate for all lifting and moving of the blowcases, shall be provided.
- 4. Each blowcase shall be provided with a 16-inch diameter quick-opening, hinged manhole for top access and observation. An access ladder and platform, designed in conformance with applicable safety standards, shall be provided.

E. Granular Activated Carbon

Westvaco shall supply and install an initial inventory of 150,000 lb of virgin granular activated carbon. The initial carbon supply shall be Westvaco Nuchar WV-G.

Price

The estimated cost for the equipment as described in this proposal is \$638,000, FOB job site.





J& B SALES CO.

3441 N. 29th AVE - PHOENIX AFIZONA 85017 TELEPHONE 602 • 258-1545

JOB Rocky Mountain Ar	senal		Page	2 1 2 0 2 1
N.N. Boundry Trea	tment System	Arch	Page Rubel & Hager	
P-105	SAN TOWNER	Engr	Rubel & Hager	
Quote No210	(本本)是一种的		Commence of the second	7-9-82
	the time the second of the sec	CAN AND COLUMN TO A STATE OF THE STATE OF TH	rate to the second by the second to a second	- Partie die Beil Garage Grand Germann Gerta

- Quan. Description

4400 E. Broadway Suite 602

Tucson, AZ 85711

Attn: Mr. Fred Rubel

Bell & Gossett Model 1531 - 2AC Close Coupled Pump.
Duty: 175 gpm @ 175' TDH 5,200' Elev.
15 HP 460/3/60 3500 rpm ODP Motor

Total Price FOB Factory, FFA Commerce City, Colorado. .\$1,600.00

Starters, Vibration Bases & Accessones Are Not Included Unless Quotation Automatically Expires Thirty (30) Calendar Days From The

UOTATION



P.O. BOX 310, QUAKER RD., GLENS FALLS, N.Y. 12801/TEL. 518-793-8801/TELEX 145339

Mr. Fred Rubel RUBEL & HAGER 4400 East Broadway Suite 602 Tucson, AZ 85711 July 8, 1982

Quotation Number: Q82-041T

5-104

QTY.

UNIT PRICE

TOTAL

1 AES Model 5250S20A2 Multiple Filter with external backwash

70,133.00

Application: Granular Activated Carbon

Pressure Rating: 25 psi (operating pressure)

Flow: 1500 gpm

Fabrication: 316 stainless steel

Construction: 20 barrels; assembled and mounted

on a mild steel frame.

Inlet/Outlet Header Size: 12" flanged External Backwash Header: 2" threaded

Drain Size: 2-1/2" threaded .003" wedge wire

Valve Size & Seats: 2" Teflon

Seals: EPDM

Gauges: 0-400 psi

Filter Media Area: 8160 sq. inches

Backwash Automation (Time Clock and Differential

Pressure Switch)

Option:

Service Step

500.00

Reference Drawing: D-10640

WARRANTY: ALBANY ENGINEERED SYSTEMS WARRANTS ALL AES PRODUCTS AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP IN NORMAL USE FOR ONE YEAR FROM DATE OF SHIPMENT, SUCH WARRANTY BEING LIMITED TO REPLACEMENT OR REPAIR OF DEFECTIVE PARTS AT OUR DISCRETION. WE HAVE NO LIABILITY FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED. THERE ARE NO OTHER WARRANTIES EXCEPT AS SET FORTH ABOVE.

P.O. BOX 310. QUAKER RD., GLENS FALLS, N.Y. 12801/TEL, 518-793-8801/TELEX 145339

Page Two

Quotation Number: Q82-041T

MANUALS : Two operating manuals supplied with purchase of this

equipment. Additional manuals \$15 each. Reproducibles

of drawings (sepias or microfile aperture cards)

available at \$5 each.

START-UP

SERVICE: For the AES Products as outlined in this quotation, no

charge service will be provided as follows:

Field Service Technician: Two Days

Applications Engineer : Two Days

The customer has the option of assigning this no charge

service time for Training Sessions, Installation

Inspection or Start-Up Assistance. Should additional

service be required, the following rates apply:

Field Service Technician @ \$220 per day

Applications Engineer @ \$350 per day

When service is scheduled by the customer with less than one week's notice, travel expenses will be charged A Purchase Order must be issued to cover the

additional service requirements beyond the allocation

as stated above.

VALIDITY: The prices quoted are firm for order placement 60 days from the date of this quotation for delivery not to

exceed six (6) months from date of order issuance.

WARRANTY: ALBANY ENGINEERED SYSTEMS WARRANTS ALL AES PRODUCTS AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP IN NORMAL USE FOR ONE YEAR FROM DATE OF SHIPMENT, SUCH WARRANTY BEING LIMITED TO REPLACEMENT OR REPAIR OF DEFECTIVE PARTS AT OUR DISCRETION. WE HAVE NO LIABILITY FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED. THERE ARE NO OTHER WARRANTIES EXCEPT AS SET FORTH ABOVE.

QUOTATION



P.O. BOX 310, QUAKER RD., GLENS FALLS, N.Y. 12801/TEL. 518-793-8801/TELEX 145339

Page Three

Quotation Number: Q82-041T

SHIPMENT: After receipt of order and full customer approved

technical data enabling us to proceed with engineering and manufacturing, our delivery schedule for the equipment specified in this quotation is detailed below. Any delay in our receipt of customer approved technical

data may adversely affect the delivery date.

FOB: Denver, Co - 12-14 weeks

TERMS : 25% with prints for customer approval - Net 30 days.

75% at shipment - Net 30 days.

ACCEPTANCE: Orders are subject to acceptance at Glens Falls, NY.

ву:	 Peg Campl	pell
	Customer	Service

WARRANTY: ALBANY ENGINEERED SYSTEMS WARRANTS ALL AES PRODUCTS AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP IN NORMAL USE FOR ONE YEAR FROM DATE OF SHIPMENT, SUCH WARRANTY BEING LIMITED TO REPLACEMENT OR REPAIR OF DEFECTIVE PARTS AT OUR DISCRETION. WE HAVE NO LIABILITY FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED. THERE ARE NO OTHER WARRANTIES EXCEPT AS SET FORTH ABOVE.

PROPOSAL

P.O. Box 6753

Phoenix, Arizona 85005-6573

(602) 269-1323



Tucson, Arizona 85726-7024 (602 792-3255

FORMERLY AIR COMPRESSOR SERVICE

TO:

Rubel and Hager, Inc.

DATE <u>July 8, 1982</u>

This proposal effective for 30 Days.

Attn: Mr. Frederick Rubel, Jr., P.E.

Gentlemen	: We are pleased to quote on the following equipment:	c-101	
QUAN.	DESCRIPTION	UNIT PRICE	AMOUNT
ONE	INGERSOLL-RAND COMPRESSOR PACKAGE, MODEL 7E3, COMPLETE		
	WITH THE FOLLOWING MAJOR COMPONENTS:		
·	a) BARE COMPRESSOR #253 b) 7½ H.P. NEMA 3 PHASE 230/460 V MOTOR c) 120 GAL. ASME RECEIVER TANK d) PRE-WIRED AND MOUNTED MAGNETIC STARTER e) AIR COOLED INTERCOOLER f) ENCLOSED BELT GUARD g) AUTO/START/STOP CONTROL h) SAFETY SERVICE AND DRAIN VALVE.		
	PERFORMANCE DATA		
	a) 26.2 CFM PISTON DISPLACEMENT b) 20.3 CFM @ 100 PSI c) COMPRESSOR RPM - 660.		
	TOTAL NET PRICE	•	2,800.00
	All Applicable Taxes to Apply		· · · · · · · · · · · · · · · · · · ·

F.O.B	Delivered Job Site	
Delivery .	One week	
Torms	Net 30 days	

PIONEER EQUIPMENT, INC.

BY Dick Cahill

This quotation not valid unless signed

Prices quoted are subject to adjustment to price in effect at time of shipment.

Warranty is limited to that on new machines as furnished by Manufacturers or as otherwise stated herein.

All items quoted herein are subject to prior sale or other disposition.

All orders taken which require financing are subject to the approval of our credit department or that of the financing institution.

Delivery date given on this order is contingent upon promised shipment from our suppliers and upon government restrictions or other factors beyond our control.

The above proposal is hereby accepted as outlined:

Customer ______BY ____

Northwest Boundary Containment Treatment Facility Rocky Mountain Arsenal, Commerce City, Colorado Stearns-Roger Subcontract No. 7000 C26616

Process Design Calculations

Prepared by: D. G. Hager Checked by: F. Rubel, Jr.

I. Sizing of Liquid Phase Adsorption Vessels

A. Design Criteria

- 1) Superficial residence (empty bed) time required in upflow packed granular activated carbon bed for removal of 0.8 µg/l excess DBCP from potable water 15 minutes minimum.
- 2) Raw water flow rate 1500 gpm maximum.
- 3) Standard Westvaco Pulse Bed Adsorber volume 1400 ft.3.

B. Calculations

- 1)a. Try two (2) standard Pulse Bed Adsorbers Volume = 2 x 1400 ft³ = 2800 ft³ = 21,000 gallons

 Superficial Residence Time = 21,000 gallons = 1500 gpm

 14 minutes <15 minutes. NG
 - b. Try three (3) standard Pulse Bed Adsorbers Volume = 3 x 1400 ft³ = 4200 ft³ = 31,500 gallons Superficial Residence Time = 31,500 gallons = 1500 gpm
 21 minutes >15 minutes. OK
 Use Three (3) standard Pulse Bed Adsorbers

2) Flow rate per adsorber

1500 gpm = 500 gpm/adsorber
3 adsorbers

II. Process Pipe Sizing

A. Design Criteria

- 1) Pipe material schedule 80 Type I PVC
- 2) Flow rate per treatment branch (train) = <500 gpm
- 3) Raw water velocity ≤8.0 ft/sec
- 4) Treated water velocity ≤5.0 ft/sec
- 5) Slurry Flush/Eductor/Backwash water velocity ≤8.0 ft/sec

B. Calculations

- 1) Raw water pipe size (identical piping for each train)
 - a) Try 4", v = 8.99 ft/sec >8.0 ft/sec :. NG
 - b) Try 6", v = 6.27 ft/sec <8.0 ft/sec .. OK

Use 6" Schedule 80 Type I PVC Pipe and Fittings for Raw Water.

- 2) Treated water pipe size Effluent from one adsorber
 - a) Try 6", v = 6.27 ft/sec >5.0 ft/sec \therefore NG
 - b) Try 8", v = 3.57 ft/sec <5.0 ft/sec .. OK

Use 8" Schedule 80 Type I PVC Pipe and Fittings for Effluent from one Adsorber.

- 3) Treated water pipe size Effluent from two adsorbers
 - a) Try 8", v = 7.14 ft/sec >5.0 ft/sec . NG
 - b) Try 10", v = 4.54 ft/sec <5.0 ft/sec .. OK

Use 10" Schedule 80 Type I PVC Pipe and Fittings
for Effluent from two Adsorbers.

- 4) Treated water pipe size Effluent from three adsorbers
 - a) Try 10", v = 6.80 ft/sec >5.0 ft/sec .. NG
 - b) Try 12", v = 4.81 ft/sec <5.0 ft/sec .. OK

Use 12" Schedule 80 Type I PVC Pipe and Fittings for Effluent from three Adsorbers.

- 5) Slurry Flush/Eductor/Backwash water pipe size
 - a) Try 3", v = 8.72 ft/sec >8.0 ft/sec : NG
 - b) Try 4", v = 5.02 ft/sec <5.0 ft/sec .. OK

Use 4" Schedule 80 Type I PVC Pipe and Fittings for Slurry Flush/Eductor/Backwash Water System.

III. Carbon Slurry Transfer Pipe Sizing

A. Criteria

- Carbon Slurry Transfer to and from Carbon Transport Trailer - 4" Polypropylene lined Carbon Steel (flanged) Pipe
- 2. Carbon Slurry Tansfer to and from Carbon Blowcases - 2" Polypropylene lined Carbon Steel (flanged) Pipe
- 3. Carbon Slurry Velocity = 5 ft/sec
- 4. Dry carbon density = 30 lb/ft3

B. Calculations

1. Time to transfer 20,000 lbs. granular activated carbon truckload to or from Carbon Transport Trailer

Pipe inside diameter = 3.612 in., Area = 10.25 in.² = .0712 ft² @ velocity = 5 ft/sec Volume = 0.3558 ft³/sec = 21.35 ft³/min = 640 lb/min Transfer Time = $\frac{20,000 \text{ lbs.}}{640 \text{ lbs/min}}$ = $\frac{31.3 \text{ minutes}}{640 \text{ min}}$

2. Time to transfer 2,000 lb. granular activated Carbon Pulse to and from Carbon Blowcases

Pipe inside diameter = 1.723 in., Area = 2.35 in.² = .0164 ft² @ velocity = 5 ft/sec Volume = 0.0818 ft³/sec = 4.91 ft³/min = 147 lbs/min Transfer Time = $\frac{2,000 \text{ lbs.}}{147 \text{ lbs/min}} = \frac{13.6 \text{ minutes}}{13.6 \text{ minutes}}$

IV. Process Water Pressure Drop through each Treatment Train

A. Criteria

- 1. Since the piping design has not been accomplished at this time, a pressure drop calculation based upon conservative assumptions is provided.
- 2. Flow rate 500 gpm through 6" and 8" Pipe; head loss per 100' is 0.87 and 0.22 psig respectively.
- 3. Flow rate 1500 gpm through 12" Pipe; head loss per 100' = 0.24 psig.

B. Calculations

1. Pressure Drop through Pipe and Fittings

	Equivalent	
	Pipe Length	<u>ΔP</u>
a) 80'-6"	Sch. 80 PVC Pipe 80	
b) 3 -6"	Sch.80 PVC Tee @ 32.2' 96.6	2.3
c) 6 -6"	Sch.80 PVC 90° Ell @15.2' 91.2	
d) 40'-8"	Sch.80 PVC Pipe 40 3	
e) 1 -8"	Sch.80 PVC Tee @39.9 39.9	0.4
f) 4 -8"	Sch. 80 PVC 90° Ell @20' 80	
		Λ 2
h) 3 -12"	Sch.80 PVC 80° Ell @ 30 90	0.3
, 5	,	
		3.0 psig
f) 4 -8" g) 40'-12		0.3

2. Pressure Drop Through Valves and Flow Controller

b)	3-6:	Check Valve @ 0.1 psig@ Butterfly Valves @ 0.3 psig@ Rate of Flow Controller @ 7.0	0.1 0.9
C)	1-	psig (max.)	<u>9.0</u> 10.0 psig

3. Pressure Drop Through Adsorber and Filter Modules (pressure drop will build up in each of these modules until a maximum is reached at which time backwash or cartridge change will significantly decrease the pressure drop).

	ΔΡ
<pre>a) Prefilter Module - 15 psi (max.) b) Pulse Bed Adsorber Module -</pre>	15.0
25 psi (max.)	25.0
c) Post filter Module - 10 psi(max.)	10.0
	50.0 psig
4. Gravity head - 12 ft.	5.2 psig
5. Velocity head	0.3 psig
6. Total AP (1 through 5 above)	68.5 psig

JOB NO_ 266/6 DATE 7-2-82 BY GOO CH'K_ CUSTOMER RMA. PROJECT GROWN WATER TREATHENT.
SUBJECT DESIGN LOALS STRUCTURAL. BUILDING LOADS PRELIMINARY DESIGN.
ROOF DEAD LOAD = 20 pst, (-0 -- 1) LIVE LOAD OR? = 30 ps x = (0.8 x 35 psf)

SNOW LOAD AT MED SPAN = SAY 5.0 K. WALL LOAD = 24 psf. Ansi Exposure C" WIND LOAD JONE 1 SEISMIC 3000 psf. SOIL BEARING PROSSURE Equipment Loads Encul = 140,000 Ls. ADSORBERS DUAL BLOW CHSE = 2000 lu EA CA 75,000 lbs STORAGE MODULE = PREFILTERS
POST FILTER
FUMPS ACCES WALKUAY BEAD LOAD = 25 pif LIVE LOAD = 100 psf ALLOWANCE OF GROUT FOR LEVELLING. TOUNDATION DEPTHS TO BEROW FROST LINE of 31-6: AEIM 9. 1/81.

FORM 62-114 REV. 4-75

JOB NO 26616 DATE 7-2-82 BY GOW CHIK CUSTOMER R.M.A. PROJECT GROUND WATER TRENTALENT SUBJECT FONDATION LOADS FROM BUILDING CANTER CUS. TRIBUTHRY WIDTH 25/0 Span 4010" HEIGHT 301-0" Roof DL = 20 = 25-0 LL = 30 = 25-0° REACTION AT COL: 1.25-49 5-0" GN7NGENCY + 2.5% Roof TOTAL /COL = 27.5% LOAD FROM SAING - 5×25×300 = 3.75K TOTAL VERTICAL AT BASE END COLS WILL BO /2 THIS LOAS
PLUS VERTICAL END WALL LOAS = 31.25/2 + 5x14x30 WIND LOAD ON SIDE WARL | = 24x 25'-0" = 0.6" A CENTER COL 0.3" / LED COL By INSPECTION WIND WILL CONTROL BUILDING DOCTION AND SEISMIC WILL CONTROL FOUNDATIONS FOR INTERIOR VEBSELS.

8

JOB NO. 266/6 DATE 7-2-82 BY GES CHIK

CUSTOMER RICH PROJECTIFICAND WATER TERMINATE
SUBJECT FOUNDATION LADS FROM BUILDING

FROM STREZ DESIGNARS MANUAL BY UNGER

VSE FRAME TYPE II (29 29).

1.254/4 DL LU

O.64/4 B I2 50%

N = 24 + 3

= 4.75

$$\frac{Roof \ 2l-Ll}{MB-MC} = \frac{1.25 \times 40^{2}}{4 \times 4.75} = -65.26 \times 6$$

$$VA = VD = \frac{Wl}{2} = +25.0 \times 6$$

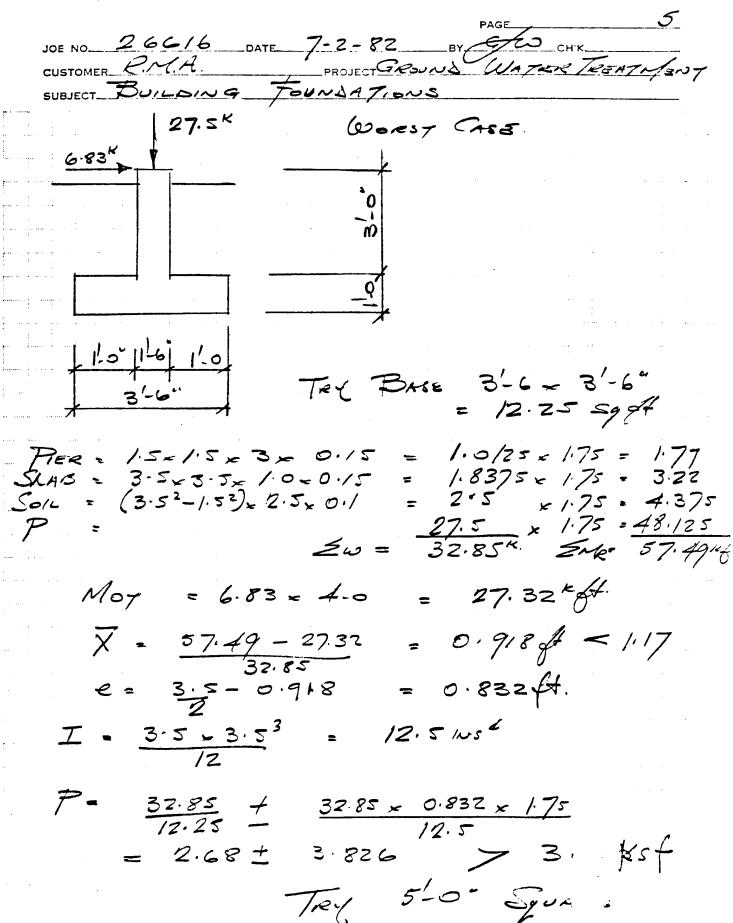
$$HA = HD = -\frac{105.26}{30} = -3.5 \times 6$$

 $MB = \frac{0.6 - 30^{2}}{2 \times 4.75} - \frac{0.75}{2 \times 4.75} + 17 = + 124.2\%$ $MC = \frac{0.6 - 30^{2}}{4} \left[\frac{-0.75}{2 \times 475} - 17 \right] = -145.8\%$ $HB = -\frac{MC}{H} = -\frac{145.8}{200} = -4.86\%$ $HA = -\left(0.6 \times 30 - 4.86\right) = + 13.14\%$ $VA = VD = -\frac{0.6 \times 20^{2}}{2L} = VA = -6.75\% D = +6.75\%$

JOE NO. 26616 DATE 7-2-8 CUSTOMER RMA PROJECT GRESUBJECT FOUNDATION LOADS FROM	PAGE BY GOOD CH'K BOUND WATER TREATMENT PON BUILDING.
5.0 K GN7WGENCY LOAL. MB = Mc = - 3-5-40 8 x 4.75	= -15.8 mgf
VA = VD = 5/2	= 42.5 K
HA = HD = - 15.8	=-0.53*

TOTAL LOADS

LOAD	Me	Mc	VA	VD	HA	40
DLYLL	-105.26		+ 25.0	425.0	-3.5	-3.5
WIND	+124.2	-148.8	- 6.75	+ 6.75	-4.86	+ 13.14
5.0K.	-15.8	-15.8	4 Z,5	+ 2·5	<i>− 0</i> · 53	-0.53
DC+LC+5.0	-/21.06					
WITHWIND			· ·			
AT 0.75	2.364	2004	+ 15.56	+25.69K	-6.67K	+ 6.83K



JOB NO. 266/6 DATE 7-2-82 BY GW CH'K. CUSTOMER PROJECT GROWN WATER TREMTMENT SUBJECT BUILDING FOUNDATIONS PIER = 1.5x 1.5x 3x 0.15 = 1.0/25x 2.5 SLAS = 5.0 x 5.0 x 1.0 x 0.15 = 3.75 x 2.5 Soll = (5.02-1.52) x 3x011 = 6.825 x 2.5 = 27.5 = 2.5Sw = 39.1K. SMR = Mo7 = 6.83-4 = 27.324 97.72-27.32 = 1.8 A e = 5:0 - 1.8 = 0.7 ft $I = \frac{5.0 - 5.0^3}{17} = 57.08 \cos^4$ $P = \frac{39.1}{25.0} + \frac{39.1 \times 0.7 \times 2.5}{52.08}$ = +2.878 kst < 3.0 +0.25 kst = 1.564 ± 1.314 + 1.75 th FACE of FIER BN(@ Face of Pier = 1.958 x 1.75 2 + 0.92 x 1.75 20.66 $As = \frac{M}{ad} = \frac{4.0}{1.76 - 9} = 0.25 B$ $M_{IN} As = 12 \times 12 \times 0.002 = 0.288 B$ USE # 5@ 12 CRS BOTH WAYS IN SLAB.

CUSTOMER R.M.A. PROJECT GROUND WATER TREATMENT SUBJECT BUILDING FOUNDATIONS PIER REINFORCING. 20 49 × ft BN = 6.83 x 3:0 = 0.8c2 = " As = 20.49 1.76 × 13.5 USE Z-#6 As=0.88" So Use 4 - # 6 in pieces with #3 Ties AT 12" Confees. CHENER COLS WILL HAVE 1/2 ROOF LOAD & 1/2 WIND LOAD. BUT WILL HAVE ADDITIONAL SISING LOAD. 6.83/2 = 3.42K So HORIZONTAL FROM WND = FROM Roof = 25.0/2 + 3.75/2 FROM Roof = 25.0/2 + 5.0k Continguncy = 1.5% = 1.875* = 12.5 K 5-0 20-875 /0 - Vary SAY 21.0K Ter 3-6" Sy BASE (\$95) = 1.0125 × 1.75 Tiel : 1.5x1.5x2-0.15 1.8375 - 1.75 3.2Z JAB = 3.5 x 3.5 x / 10 x 0 /5 Sou = (3.52-1.52) x 2.5x0.1 = 2.5 2 1.75 = 4.375 1.75 36.75 21.0 1c $\leq_{\mathcal{M}}$ Mo7 = 3.42 x 4.0 = 13.68 Kf

JOB NO. 26616 DATE 7-6-82 BY ALD CH'K.

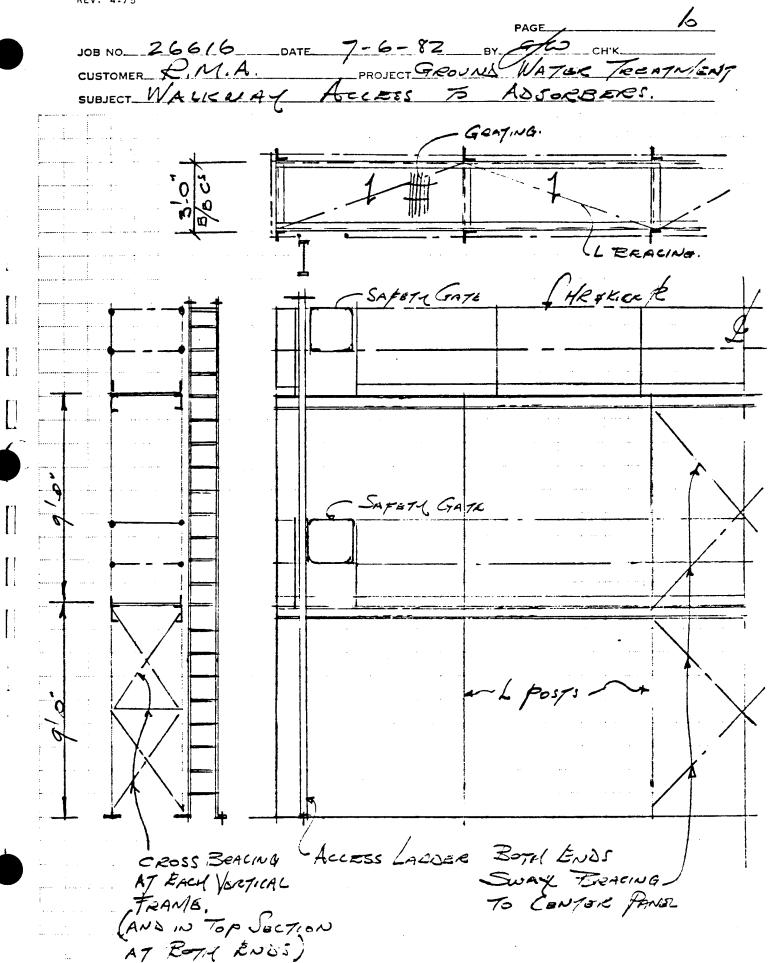
CUSTOMER R. N. A PROJECT GRAND 11/4-10-1 SUBJECT BUILDING FOUNDA TIONS CORNER COLS (Cony). 1.23 ft. X = 46.11-13.68 26.38 0.5294 e. 3.5 - 1.23 I = /2.5 ms P= 26.38 + 26.38 × 0.52 × 1.75
12.25 - 12.5 2-15 £ 1.92 = 4-07 > 3.0 FOR PRELIMINARY DESIGN
USE 400 Sy SwiTH #50 /2" CAS
USE SAME FOR PIECE 1-6" SQUARES
4-46 \$# 37165. EQUIPMENT FOUNDATIONS WITH EQUIPMENT BEING INSIDE BUILDING SEISMIC WILL GNIFROL DESIGN OF FOUNDATION ADSORBERS W= 140" ENCH, 9'-0"\$, 23-0" HIGH V-ZKCW - 0.25 x 2.0 x 0.1 x 140 = 7.0 K OTM = 7.0 = 11.5 = 80.5 Kgf ROSISITING MONIENT = 140x 4.5 = 630 M/F + BASE WRIGHT = 91.0x960 = 0.83x015 = 10.12 x 45 = 455 M/F

FORM 62-114 REV. 4-75

JOB NO_ 266/6 __DATE 7-6-82 __BY 965 _CHIK___ CUSTOMER_PMA_ PROJECTGROUND WATER TRUMINANT SUBJECT FOUNDA TONS. ADSORBERS (ONT). 3.96 A X = 675.5 - 80.5 e = 9.0 - 3.96 0.544. $I = 9.0 \times 9.0^3$ 546.75,ws4 P = 150./2 + 150.12 x 0.56 x 4 5 546.75 - 1.853 f + 2.52 KST 0.667 1.186457 OK - 3-0 KST Mino As = /2×/0×0.002 0.24 Sq 105 the # 40 9" CRS (AS = 0.27)
BOTH WHYS IN DOTTON. By Inspacyion of ALC ROUIPMENT LOADS AND SIZE OF FOUNDATIONS, USE THE KROVE FOR ALL LARGE FOUNDATIONS USE 1-3 THICK SUAR + 2" GROUT ALLOWANCE TO KNOW FOR I'M ANCHOR BOT PULL OUT CAPACITY

EMBEDMENT LENGTH OF 12"

TOOK SLAR 6" THICK KEINFORCED WITH ONE LAYER WWF 4-4-W4.0=W4.0



				PAGE _		
	2/1/1/2		7-8-82	ov TKO	chik	JMC
JCB NO.	Proxx	Nlm)	DATE <u>1-8-82</u> ARLENHL PROJECT	RAN WATER	TREATMENT	FACILITY
CUSTOME	TOILET_	Room	7403201			
SUBJECT.		100				

VENTILATION

SIZE OF ROOM 6'WX 8'LX 9'H -> FROM ARCH.

MIN. VENTILATION = 10 AC/AR. PER TMS-810-1 PG. 22

VOLUME OF ROOM= (6)(8)(9) = 432 FT3

:. MIN CFM = (432FT3) (10) (HR (60111N) = 7.2 CFM

COST OF FAN FROM MEHO 1582 PGZZ6 => #63.00
INSTALLATION = 1 M. H.

ZOFT DUCTWOKK @ 166/FT > COST = #3.20 IOSTALLATION > . OS M.H. /FT TOTAL = 1 M.H.

WALLGAILLE -> 6"x6" COST = 5.00 LABOR = 1M.H.

		PAGE	
JOE NO. 26616	DATE 7-8-82	BY	CH'K JMC
CUSTOMER	PROJECT_		
SUBJECT TOLET	Room		

HEATING

Two OUTSIDE WALLS > U= ,15 F.FIL

AREA WALL 1 8'WX8'H = 64FT2 WALL Z 6'WX8'H = 48FT2

TOTAL HREA = 112 FT2

DESIGN TEMP FROM TITS-BID-1, PGI, TEMP: 60°F FROM TMS-785 WENTER DESIGN DRY-BULB > 97.5%: 10F

:. DT= 60-1 = 59°F

ESTIMATE UVALUE OF INTERNAL WALLS & CEILING = ,30 ST. FILL FROM ASHRAE 1981 FUNDAMENTALS TAKE4C PG 23.21

AREA OF WALLS = 112 FT SAME AS EXTERIOR WALLS AREA OF CEILING = 8' + 6' = 48FT2

1. TOTAL AKEH = 160FT2 ST= 60-40 = 20°F

: Q = UA DT = (3)(160)(200F) = 960 BTOH

. TOTAL HEAT NEED= 960 + 990 : 1950 RTUH ~ 2000 BTUH ~ 600 W

FORM 62-114 REV. 4-75

Stearns-Roger

	·	PAGE 3	
JOB NO.	DATE		CH'K. JMC
CUSTOMER	PI	ROJECT	
SUBJECT			
DESIGN USIN	TOFRARED HE A DATED 550 TRKE = \$47.00	EATIOG. W GRANGER STO	ck #541374
120V	> #40		

USING A GENERA ELECTRIC QH 500 TB 500W INCAMDESCENT LIGHT WITH A RECECSED FINITIE. PRILE AT 1.00. USE A THENMOSTIN = 40,00 TO BE ESTIMATED BY ELECTRICAL.

JOB NO. 26616 DATE 7-1-82 BY TICO CH'K JMC CUSTOMER ROCKY INTIO. AKSENAL PROJECT RAW WHITER TREATMENT FIXILITY SUBJECT HEIRT LOAD CALC.

ASSUME U VALUES:

WALL= .15 F-FT2 } REF DOD. 4270; 1-M TARLE9.2

ROOF = .10 OF-FT2

DESIGN INTERIOR TEMP= 400F , REF: NO 4270.1-M, CH. 9-2.1

CALL. OF HEAT LOAD.:

DEF.: ASHRAE FUNDAMENTALS 1981 - 25.2

Q=UA*TD

WINTER DESIGN DRY-BUR > 97.5% = 10F TM5-785 :. TD=40-1=39°F

FRON AKCH. DOG. ROOF AREA = (40 FF)(73FT) = 2920FT2

WALL AREA = 30FT (2(40FT) + 2(73FT)) = 6780FT2

Q=UA AT > Q WALL = (.15)(6780)(39) = 3970 CBTUH Q ROOF = (.10)(2920)(39) = 11400 PTUH 51100 BTUH

TOTAL HEAT LOAD FOR WINTER = 51100 BTOH DUE TO TEADSMISSION HEAT LOS

			PAGE	
JOB NO.	DATE	E	TKO	CH'K JMC
CUSTOMER	····	PROJECT		
CHRIECT				

PER ASHRAE CH 22.8 ESTIMATE 1 AC./HR. DUE TO INFILTRATION

.. VOLUME OF AIR > (30)(40)(73) = 87600 FT³

.. Q = (1.08)(.825)(CFM)(AT)

=(1.08)(.825)(\$7600)(\$\frac{1}{2}\$)(40-1)

= 50 800 BTJH

.. HEAT LOAD DUE TO INFILTRATION = 50800 BTUH

HEAT LOAD THRO SLAB => ASHRAE 1981 FONDAMENTHUS => 25.8>25.9
Q=F2P(Ti-To)

EST. FOR A METAL STUD WALL WITH INSULATION FZ= .53
P= PERIMETER OF PLAC = (2X40')+ 2(73)=226 FT

... Q=(.53)(226)(40-1) = 4670BTUH

.. HEAT LOAD DUE TO FLOOR SLAB = 4670

.. TOTAL DESEN HEAT LOAD = 51100 50800 4670 104570 BTUH

ADD 15% SAFETY FACTOR > (1.15) (106570) BTUH = 122560 BTUH

				PAGE J		
JC B NO	DATE		aY	TKO	CH'K	JMC
JCB NO.	_ U/\ \ L	······································				
CUSTOMER		_PROJECT				
CITETECT						

HEATING LOAD = 122,560 BTUH

USE 4 MODINE PA-50 HEATERS
RATED INPUT 50,000 ETUH

OUTPUT: 40,000 ETUH

DERATED. INAUT. (.84)(50,000) = 47,000 ETUH OUTPUT: (.84)(40,000) = 33,600 ETUH

TOTAL CAPACITY: INPUT: (4)(47,000)= KB,000 EXH OUTPUT: (4)(33,600)=134,400 ETUH

HEAT THROW (FZ):23

PROPANE: 20 CFh EA. OR BO CFh TOTAL

COST FOR UNIT HEATTER: \$ 480.00 EA WITH INTERMITTENT PLOT LAKER. 1614. H. TOTAL

COST FOR 5" DIA. VENT CHIMINEY: 5" DIA > 100 FT

MATERIAL: \$2.50 L.F > \$250.00

LAKER: 25 M.H. .25114/L.F.

THERRICETATS B-C TA-121 MATERIAL \$ 55 EA.

PIPULG . 3/4" - 200' TOTAL PIPING

50' UNDERGROUND > IL M. H. + TRENCHER

150' HUNG > 24 M.H.

MATERIAL # 1.00 LF = #200 FITTINGS = #200

JOB NO. 26616 DATE 7-7-87 BY TKO SHIK NHC CUSTOMER ROCKY BY ARGENTH PROJECT RAW WATER TREATMENT FACILITY SUBJECT CARC. OF PROPER USAGE

REF. HEAT LOAD (ALCOLATIONS.

: QWALL = (.15) (6780) (AT) = (017) (AT)

QROOF = (.10) (2920) (AT) = (292) (AT)

QTRANSMISSION = (1017+292) (AT) = (1309) AT)

QINFILTRATION = (1.08) (.825) (87600) (.760) (AT)

= (1301) (AT)

QSLAG = (.53) (.226) (AT) = (120) (AT)

: QTOTAL = (1.15) (1309+1301+120) (AT)

= (3140) (AT)

REF. ASHRAE SYSTEMS 43.12 FOR DENLER AREA

CUTLDOR		BTUH @	∆T ∠	BTOH	TOTAL
TENIA	HRS	105	40F	HEAT LOSS	BIU
37	717	3140	3	9420	6754140
32	721		8	25 120	18 11 1520
27	<i>5</i> 53		13	40820	22 573 460
22	359		18	56520	20 290 680
17	216		23	72220	15 599 520
12	119		28	81920	10 462 480
7	78		33	103620	E082360
Z	36		· 38	119320	4295520
-3	22		43	135020	2 9 70 440
-8	6		48	150720	904320
-13	1		53	166420	166420
-18	1		5 8	182120	182120

TOTAL

110 392 980 RTJ

ASSUME 80% EFFICIENCY ON HEATERS = 110392980 = 137,911,230 1570
,80

92000 BTU => GAL PROPANE: ET 911730 = 1500 GAL
GAL. PROPANE
92000

... DESIGN YEAKLY USE OF PROPANE = 1500 GAL

		PAGE)	
JOB NO 26616	DATE 7-7-82	BY TKO	CH'K	JUC
CUSTOMER	PROJECT			
SUBJECT				
00000.				

.. SIZE FOR 1000 GAL PROPAIDE TANK TO BE FILED INDOTHLY IN THE WINTER

COST OF TANK: \$1500.00
REGULATING VALVE \$50.00

MUST INSTALL TANK 25FT MIN FROM BLOG.

INSTALLATION: 16 M.H.

HANGERS FOR THE HEATERS > \$20.00 FOR EA HEATER

ISOLATION VALVES FOR HEATERS AND REWLATOR, 1. 10 VALVES 4000 EA.

VENT CAP @ \$20 EA .. \$80.00

		PAGE	
JOB NO	DATE	BY TKO	CH'K JMC
		OJECT	
SUBJECT			

MH-1	UH-Z
BLOK	
	-
•	
WH-3	UH-4

TAUK 1004

JOB NO. ZLOCIO DATE 7-7-82 BY TKO CH'K JMC CUSTOMER ROCKY MTN. AKSENAL PROJECT RAW WATER TEXATMENT FAC.

SUBJECT COCLING LOAD

ASHRAC FUND. 1981 PG.ZG.3 Q=U*A*CLTD

COOLING LOAD DUE TO BOOF

V= ,10 = FT DOD 4270,1-M TABLE 9.2

A = (40')(75') = 3000FT2

CLTD > ASHRAE, FUND., PG. 26.8

TABLE SA CLTD = 79°F @ 14:00

PB. 26.8 CLTDCORR = [(CLTO+LN)K + (78-TR)+(5-85)] * 9

WHERE TROOM = 102°F EQUIPMENT MAX. TEMP.

TOUTSWE = 91°F 97.5% SUMMER DRY BULIS TAIS-785

f = 1.0 No ATTIC

LM=2 FROM TAIBLE 9A

K=1.0 INDUSTRIAL AREA

.: CLTDCORR (79+2)+(78-102)+(9+85)

= 63°F

:. Qeof = (, 10) (3000) (63) = 18900 BTUH

COCLING LOAD DUE TO WALLS

U=. 15 9-FT- DOD 4270.1-19 TABLE 9.2

AREAS OF WALL - NORTH AREA = AN= (40')(30') = 1200FT
SOUTH AREA = AS = (40')(30') = 1200FT
EAST AREA = AE = (75')(30') = 2250 FT
WEST AREA = AW = (75')(30') = 2250 FT-

FROM TARLEG GROUPB WALL

:. FROM TABLE 7A: NORTH WALL 2:00 CLTDN = 9°F

SOUTH WALL 2:00 CLTDs = 12°F

EAST WALL 2:00 CLTDs = 14°F

WEST WALL 2:00 CLTDN = 14°F

PG 26. 12 > CLTD CORR. (CLTD+LM) × K+ (78-TR)+ (TO-85)
SAME DESIGN CONDITIONS AS ABOVE

SUBJECT

Stearns-Roger

JOB NO. 2666 DATE 7-7-82 BY TKO CH'K. JMC

CUSTOMER ______ PROJECT______

CLTDORRN = (9+1)(1.0)+(78-102)+(91-85) = -84

CLTD coxes = (12-1)+(78-102)+(91-85) =-79F

CLTUCORE = (72+1) + (78-102)+ (91-85)

CCIDORRN = (A+1) + (78-102)+ (91-85)

... QNORTH WALL = (.15)(1200)(-8) = - 1440BTUH = QNW QSOUTH WALL = (.15)(1200)(-7) = - 12 00 BTUH = DSW QEAST WALL = (.15)(2250)(-5) = 16 90 BTUH = QEN QNEST WALL = (.15)(2250)(-3) = -1010 BTUH = QWW

:. TOTAL & FRENT WALLS > QN = QNN + QSN + QEN + QNN = -1440-1260+1690-1010 QN = -2020BTUH

:. TOTAL TRANSMISSION GAIN = GROCK + QWALL = 18 900 + (-2020) :. QT = 15180 ETUH

ESTIMATE LIGHT LOND = 1 W/FT2

(USE INCANDESCENT LIGHTS

HAZER = (40')(75') = 3000FT2

QL = (1"/FT2)(3000FT2)(3.4 ETCH)

QL = 10200 ETUH

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JCB NO.	26616	DATE	1-1-82	,	CH'K	JMC
CUSTOME			PROJEC			
CUBIECT						

ESTIMATE EQUIPITENT, PUMP & AIR CONPRESSER MOTOR LOADS TO BE 20 H.P. TOTAL. FROM ASHRAE 1961 FUNDAMENTALS TABLE 24 PG. 26.29 MOTOR IN, DRIVEN EQUIPMENT OUT OF THE AIR STREAM:

Qm=7610 BTOH

PERSONNIEL LOAD
FROM ASHRAE 1981 FUND., TABLE 18, PG.ZG.ZS LIGHT BENCH
WORK, MALE

QP=880 BTUH

I. TOTAL DESIGN HEAT LOAD IN THE BLOS.

15/80 BTUH - TRANSMISSION

10200 BTUH - LIGHTING

16/10 BTUH - MICTORS

PED BTUH - PERSONNEL

QUATRIL = 33870 PETUH

AND 20% SAFETY FACTOR

: . QTOTAL = (1.2 X 33570) . 40650 BTOH

DENGN FOR A ROOM TEMP. = 102°F COTSIDE AIRTEMIP. = 910F .: AT= 11°F

: AMOUNT OF VENTILATION AIR > 40650
(1.08 X.825)(AT) = 40650
(1.08 X.825)(AT)

CFIII= 4150

			PAGE JIT	
INR NO 2/06	DATE	7-7-82	BY TKO	CH'K_ JMC
300 40.				
CUSTOMER		PROJECT		
CLIDICAT				

ACCORDING TO TM5-810-1 PG. 20 DESIGN USING GRAVITY AIR MOVERS WITH MANUAL SHUT OFF DAMPERS BASED ON A WIND VELOCITY OF 4111PH.

DESIGN FOR A STACK HEIGHT OF SOFT AND A TEMP. DIFF. OF 100F.

- .. DESIGN USING A PENN AX-AIR RIOCE GRAVITY ROOF VENTILATOR AT DESIGN CONDITIONS \$ 359 CFM OPENING FT2
- : OPEN AREA NEEDED 4150CFM = 11.6FT-359CFM/FRZ

FROM PERFORMANCE TAKE A 1250X 10FT LONG UNIT HAS A CAPACITY OF 2620 CFM. THEREFIXE 2 UNITS ARE NEEDED.

COST OF EACH UNIT IS \$40000.

DESIGNED ARCORD ARMOD. INFORMATION ON UNITS ARE NOT GIVEN. SINCE LOUVERS ARE NOT INSTALLED FOR MAKE-UP AIR AND THE EFFICIENCY OF ARMICO GRAVITY AIR MOVERS IS UNKNOWN SEE FOR THREE UNITS AT 12 IN. WIDE X 10 FT LONG.

JOB NO. C-26616 DATE 7-8-82 WEW CHR

CUSTOMER COE - RMA N.W. BOUNDARY CONTAIN/TREAT. SYS

SUBJECT CONCEPT LIGHTING CALC. - BLDG. INTERIOR

BLDG. INTERIOR DIMENSIONS (APPROX)

75 FT x 39 FT x 29 FT HIGH

FIXTURE TYPE: PRISMATIC GLASS REFLECTOR

MFR.:

HOLOPHANE

CAT. NO. :

1938

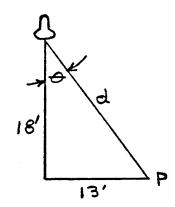
LAMP :

150 W HPS

MTG. HT. :

18 FT

FOOT CANDLE CALCULATION AT 13 FT FROM
O (NADIR)



$$TAN = \frac{13}{18}, = 35.84^{\circ}$$

 $d = \sqrt{13^2 + 18^2} = 22.2'$

I = 5300 (FROM PHOTOMETRIC TEST DATA)

$$E = \frac{I}{d^2} \cos \Theta$$

$$= \frac{5300}{(22.2)^2} \cos 35.84^\circ = \frac{8.7 FC}{AT}$$

USE 6 FIXTURES (2 ROWS OF 3 EACH)

THE CONTRIBUTION OF ILLUMINATION FROM
6 LTG.UNITS WILL INCREASE THE AVERAGE
1LLUMINATION TO AN ESTIMATED 20 FC AT
THE WORK PLANE.